GAS JOURNAL

LIGHT ✂ HEAT ✂ POWER ✂ BYE-PRODUCTS

[Founded in 1849 as the "Journal of Gas Lighting."]

PROPRIETORS: WALTER KING, LIMITED. OFFICE: 11, BOLT COURT, FLEET ST., LONDON, E.C. 4.

Telephone: Central 6055. —— Telegrams: "GASKING, FLEET, LONDON."

VOL. CLXXXVIII. No. 3474.] WEDNESDAY, DECEMBER 18, 1929. [81ST YEAR.

Editorial Notes.

The Proposed Coal Ring.

THE widespread publicity which the new Coal Mines Bill has received since its issue last week renders unnecessary any detailed account of its contents. Mr. Cook, the Miners' Secretary, is reported as having described it as the first great step in organizing this basic industry. One clause in the Bill provides that the Board of Trade shall, in the year 1931 and each subsequent year, lay before Parliament a report upon the operation of all the schemes for the time being in force under the Act. These are about the only traces of optimism we have seen. Frankly, it is difficult to believe that anything but utter disorganization can result from this sudden handing over of a very complicated industry to a highly intricate system of bureaucratic control.

A list of the units of this bureaucracy makes truly fantastic reading. A Central Council is to decide how much coal the country shall produce as a whole for certain periods in advance, and to apportion this total among the districts, which, according to a schedule to the Bill, number no fewer than twenty-one. Each of these is to have an Executive Board to allot the sub-quotas to the individual collieries, so that there are national, district, and colliery quotas to fix for each separate grade or quality of house, gas, coking, steam, and bunker coals, anthracite, and soft coals, for export and home consumption. Beyond this, provision is made for a National Committee of Investigation, to inquire into any complaints, on the part of consumers, into the working of the national scheme, and for District Committees of Investigation—presumably 21 in number—to perform similar duties in respect of the district schemes. Add to this a Coal Mines National Industrial Board, to investigate conditions of employment as between owners and men; and a truly formidable array of Committees is faced with the superhuman task of forming workable regulations for an industry comprising innumerable separate units.

Where is the Satisfaction?

ALL this complicated mechanism is to be called into being with the object of enabling the Government to redeem partly a rash pre-election promise to their supporters to shorten the miners' working day by an hour. The Bill provides for taking off half-an-hour as a first instalment, so that the miners are not obtaining full satisfaction. The owners claim that, in the past twelve months, the industry has made great strides towards recovering lost trade, and their claims are fully supported by figures. They certainly desire no "first great step" of this kind towards public control of their industry, and the memories of the havoc wrought by Government control during and after the war are still fresh in their memory. So that they too are not satisfied. What of the consumer?

The consumer, and especially the home consumer, sees himself delivered into the hands of the colliery owners, for right at the beginning of the Bill he reads that it "contemplates that these schemes will be operated *by the colliery owners themselves,* and it provides for the "schemes being so framed as to ensure that within "reasonable limits the quantity of coal offered for sale "by any colliery and the price charged for it shall accord "with the state of current demand." This can, of course, mean but one thing—limitation of output to force up the price. Nobody, we imagine, contemplates being able to make the foreigner pay more for his British coal in the open market. But restriction of output, together with a shorter working day, must inevitably result in higher costs of production, so that the difference to be met by the home consumer, who is the only one who can be forced to pay up, is difficult to estimate at the present moment. To large utility undertakings, such as gas-works and railways, it is thought likely to mean between half-a-crown and three shillings a ton. We shall be surprised if this proves enough to pay the bill.

In fairness, it must be realized that this measure is not at all of the coalowners' seeking. There is being imposed upon them, as the first great measure of a Socialist Government, a scheme which contains all the worst characteristics of a capitalistic ring or combine, with none of its redeeming features. Where is the consumer's safeguard? The necessary approval of details by the Board of Trade? Appeals to National or District Committees of Investigation? Surely, when arraigned, the owners' answer would be: "We are empowered by the Act to restrict "output and make charges in such a way as will enable "the industry to live under the seven-and-a-half-hour day "imposed by the Government. Here are the figures. "What else can we do?"

We are not concerned with party politics, but in the situation as it now exists there appears every likelihood that this unwanted, unpatriotic, almost fantastic Bill will become law. We cannot believe that public opinion will allow its provisions to exist for very long, especially when the public feels the pinch of dearer coal and all that goes with it; when the working man, for instance, finds his occupation going because his firm is compelled to pay more for its coal or gas in order that a competing foreign firm may pay less. Unfortunately, however, higher coal prices must inevitably rule for a time at least if once the Bill becomes law. But, what is still more serious, utter chaos is likely to prevail in the great basic coal industry, which will have far more than a mere temporary effect in retarding recovery.

We are far from believing that all is well with the coal industry. No doubt many other suggested remedies for its ills will come to light in the Parliamentary debates on the present Bill. We are, however, definitely of the opinion that the remedy does not lie in a scheme such as the present one, which, in addition to the other disabilities mentioned, envisages imposing artificial restriction on modern economic collieries equally with those which should have been shut down years ago.

Short Period Accounts.

It is now some time since reference was made in the "Journal" to the question of rendering gas accounts at shorter intervals than three months. The South Metropolitan and the South Suburban Gas Companies have set an example in this respect which we have expected ere this to see followed elsewhere. There will be other cases; the only doubt is as to when this will be. As we have pointed out before, monthly budgeting for household expenses is becoming general among those classes of the community who do not depend upon a weekly wage. More than one reason has contributed to making monthly household accounts popular. Living is dear; and it is perhaps necessary to keep a closer eye upon the outgoings than was formerly the case. That is one thing; but we take it that a far more powerful influence is the rise of the deferred payment system, which has in such a large proportion of homes rendered financial affairs a totally different proposition from heretofore.

What is to be the ultimate effect of the universal introduction of the deferred payment system, it is too soon even yet to say definitely; but in certain circumstances it may exert overwhelming weight. Operating normally, it has presented fresh problems and introduced new factors which we feel sure many people have not so far fully realized. One of these factors is the need for this close monthly budgeting, when a large proportion of the monthly income has been mortgaged. The class of consumer will have to be taken into consideration when deciding whether or not to adopt monthly accounts; but the custom is becoming so general in connection with ordinary trading accounts that even the people who are better situated financially will soon cease to regard monthly accounts as a nuisance. From the point of view of the gas undertaking, these short-period accounts offer the advantages of a smaller amount of money being outstanding over the greater part of the year, and of there being less likelihood of grumbling at the size of the gas bill. A disadvantage would be extra trouble, if it were incurred, but the experience of the South Metropolitan Gas Company has been emphatically in favour of the new system, and so we may leave it at that.

Our hopes of an early new convert have been raised considerably by some remarks which were made by Alderman Waddington, of Halifax, at the "B.C.G.A." conference in Huddersfield last week. He has noted that, in a period of depression like the present, and with large proportions of income allocated to deferred payment instalments, the big quarterly bill is working against the gas industry; and he announced his intention of suggesting to the Corporation very shortly that they should make their accounts embrace a period of six weeks, instead of three months. When there is municipal as well as company experience to quote, more rapid progress should be made with the adoption of the new method.

"B.C.G.A." District Conferences.

Another series of "B.C.G.A." District Conferences commenced with a very successful meeting of Yorkshire West Riding representatives at Huddersfield last Thursday, when the programme included a discussion on service within the industry as the essential need to hold and develop business. The value of these opportunities for conference on such a vital subject cannot be over-estimated. Much is being written and spoken on salesmanship and service, but a proper practice and appreciation of these subjects are fundamentals to the success of the industry. In the face of growing competition they are imperative. The whole standard of efficiency and service on the part of every undertaking—municipal as well as company—needs regular discussion. "Iron sharpeneth iron," and the interchange of knowledge regarding practice and experience in neighbouring undertakings assists in arousing and sustaining interest and in the stimulation of further effort in the perfecting of relationships with the public. The policy in the board or committee room is also frequently influenced by these conference discussions.

The second broad line of policy in the organization of the District Conferences in the past—and we understand the policy is being continued—is to waken keener interest in public health, particularly as regards the evils of smoke pollution, and to point to the practical solutions provided by the gas industry. A wise part of this policy has been to enlist the co-operation of those particularly interested in public health, and in this the "B.C.G.A." have been strikingly successful. A public lecture by Dr. Saleeby in the Town Hall, when a large audience assembled, put a crowning touch to a combined effort which, as exemplified again at Huddersfield, is of real value in rousing public interest. We understand that further conferences on similar lines to this will be organized in other districts during the early part of the coming year.

Coal Testing.

A useful paper on this subject was read by Mr. N. Partington, Chief Chemist to the Oldham Corporation Gas Department, at the last meeting of the Manchester and District Junior Gas Association—see last week's "Journal," p. 720. The author—who rightly regards gas coal as a raw material for both gaseous and solid smokeless fuels—sets out boldly to prove that laboratory tests to determine the value of a coal for this dual purpose are invaluable; and the case he advances would be exceedingly difficult to disprove, though some may not entirely agree with his assertion that laboratory methods for the evaluation of coals are equal to the results of test plant, as distinct from the plant in which it is intended to use the coal.

On more than one occasion we have pointed out that, unless the sample of coal taken for analysis and test is representative of the bulk, no results are worth the paper they are written on. This is an old story, but, as Mr. Partington suggests, it is a tale which does not generally receive the attention it merits; and his method of sampling trucks, by first digging a trench along the centre, is a good one. The author emphasizes that large screened and unscreened coals require much greater care in sampling than nuts do. Not only must there be greater care in sampling, however; the difficulties of mixing by the stage-to-stage method employed at Oldham entail further precision. Repeated quartering is undoubtedly the best hand method, but we think that on a large works there is good reason for installing some such automatic device as that described by Mr. Charles F. Kingdon in the "Journal" for Aug. 14 last, p. 356, who uses two simply constructed mechanical riffles—one for the coal as it flows from the jaw crusher, the other for dividing the reduced sample after it has been ground to pass a 1/20 in. sieve.

Particularly interesting are Mr. Partington's observations on the effect of moisture in coal on carbonizing results. Not only does moisture reduce the strength of the ammoniacal liquor and increase the carbon dioxide content of the gas, but it requires heat for its evaporation, and lowers the throughput of the retort, and hence the figure for saleable coke is reduced both indirectly and directly. With a coal containing 5 p.ct. of moisture, the author computed a loss of 0·5 cwt. of saleable coke per ton of coal carbonized. Because of this and other reasons, he is of opinion that moisture clauses should be inserted in contracts dealing with washed coals, and that it would probably be advisable to sheet coals which are on rail several days. As for ash in coal, Mr. Partington, with the vision of domestic coke sales looming large but not alone on the horizon, states that 5 p.ct. should be regarded as the upper limit. Other interesting phases of the evaluation of coal for gas-works purposes dealt with by the author include descriptions of a rapid "shatter" test of coke, and of an improved type of bomb calorimeter made by Messrs. G. Cussons, of Manchester. The latter was illustrated diagrammatically in the "Journal" last week.

Bye-Product Ammonia Recovery Developments.

IN our issue for Dec. 4 we published an account of the "C.A.S." process devised by Dr. Heinrich Koppers, in Germany. This was sent in as a contribution to the discussions of the Ammonia Sub-Committee of the Institution.

In the "JOURNAL" to-day we publish a review of this new system, as applied to British conditions, by Dr. E. W. Smith. A method which claims at one and the same time to remove all the hydrocyanic acid, make pure ammonium sulphate without the use of sulphuric acid, and deliver gas completely free from sulphuretted hydrogen, certainly "merits the very closest consideration." It will therefore be a matter of great satisfaction to the gas industry that Dr. Smith—whose knowledge of gas purification matters is indisputable—has seen fit to submit a careful and detailed review of the process.

Dr. Smith seems convinced that the process cannot be regarded as a step forward as applied to British conditions. He shows that, as regards hydrogen sulphide removal, the system will not remove sufficient to comply with British standards. Further, he considers that the process requires too close "specialized technical supervision" for a bye-product plant on a gas-works. It certainly seems reasonable that the savings of such a method must be convincing before it becomes attractive to the British gas engineer. Dr. Smith hopes that others will also contribute to the discussion; and we certainly shall be glad to publish further English or German views on this important development.

Christmas.

Perhaps the best that can be said for the fact that Christmas is fixed by the day of the month and not by the day of the week is that the inconvenience which it causes falls upon each in turn. This year it is our turn, and it will be necessary to go to press several days earlier than usual with the next issue of the "JOURNAL," so that it may be mailed on Monday evening. Will correspondents having matter for that number kindly communicate it so as to be received at the "JOURNAL" Offices by the morning of Friday, Dec. 20?

Bread upon the Waters.

One may assume that now it is the custom of most gas undertakings to post regularly as issued copies of "A Thousand-and-One Uses for Gas" to architects, business firms, and others to whom they may apply; but we are not so sure that copies are so often sent to the Free Library of the town. This is done by Mr. H. Singleton, at Huddersfield, and as the result of his statement to this effect at the "B.C.G.A." conference last week, his example in this matter will certainly be followed. Judicious use of suitable literature is an all-important side of the business of a gas undertaking, and one is not surprised to learn of the success which has attended this policy at Huddersfield.

A Delightful Advertisement.

While referring to the question of literature, we may perhaps be permitted to compliment the British Commercial Gas Association upon the delightful advertisement of theirs which appeared in last Friday's issue of "The Times." Here is revealed a perfect blend of the real Christmas spirit of peace and goodwill with the mind of the master salesman. "On this Christmas morning millions of gas taps will turn and turn again," offering an unfailing service. When thus turning the taps, many housewives will recall this advertisement, and harbour a feeling of gratitude to an industry which has added so substantially to their enjoyment of life.

The Simple Truth.

The tale told by this "B.C.G.A." advertisement in "The Times" is a simple one; and for the benefit of any readers who may not have seen it, we reproduce the letterpress appearing under the illustration: "Times have changed! The Christmas of old gave women no time for leisure. How different is the Christmas of to-day. Hours are gained where hours were lost. Labour is saved where labour was made. . . . On this Christmas morning millions of gas taps will turn and turn again to simplify cooking in seven million homes. And the gas fire's merry sun-warmth will glow from countless hearths—unattended yet unfailing. Now can all up-to-date housewives share the feasting and the fun. Times have changed for the better!"

Storage Hot Water Supply.

An important point was raised by Mr. H. E. Bloor, when joining in the discussion on "Service to the Consumer" which took place at Huddersfield last Thursday. This was with reference to finding a new domestic load comparable with that which has for so long a time been provided for the gas industry by cooking. Such a load Mr. Bloor suggests may be found in continuous hot water supply on the storage system. There is, of course, already on the market gas apparatus for furnishing such a supply; and it is for the industry to see if this storage system can be made to rank in importance side by side with the cooker—with the "millions of gas taps" which, on Christmas Day, "will turn and turn again to simplify cooking in seven million homes." From the point of view of the gas industry, the advantages of such a load are obvious; for most of it would extend over the hours of night, when there is otherwise little gas consumption. It would also be, in greater or less degree (regulated by the thermostat), a twenty-four hour load. It is not one which would create a peak at a particular hour on a particular day of the week. Indeed, so far from this being the case, it could in all instances be met without any alteration to services, meters, or internal pipes. Every possible means should be taken to secure the popularity of this system among consumers. The "hot water habit" grows apace, and an adequate supply is among the first requirements of a household.

Importance of the Street Lighting Load.

In his paper on "Service to the Consumer," Mr. H. Singleton himself emphasized the importance of the night load which hot water on the storage system would provide, when he said: "Every effort should be made to retain and if possible to increase the street lighting load. This load becomes effective when the cooking and most of the industrial load is over for the day. Good street lighting is a standing advertisement for gas, and a proof that gas for lighting purposes is the most effective form of light distribution." A "standing advertisement" is worth something; and the expenditure of time and trouble, with even some monetary sacrifice, is well worth while to secure such testimony. But if good street lighting is an advertisement for gas, what shall be said of that bad street lighting of which there are even now too many examples to be found?

Benzole Recovery by Active Charcoal.

On later pages to-day we publish Part III. of the paper by Hollings, Pexton, and Chaplin on benzole recovery by active charcoal. Comment on the paper as a whole was made in last week's "JOURNAL," but we would like to say a few words in regard to fig. 13, which compares the relative rates of depreciation of the charcoal with and without hydrocyanic acid present, and may, without some explanation, be somewhat misleading. The conditions of experiment were abnormal—gas and steam passed in the same direction through the charcoal, and preheating was carried out prior to distillation. The loss in capacity of the charcoal in the absence of hydrocyanic acid in this particular experiment is due not to gum formation, as may be thought at first sight, but to the accumulation of heavy hydrocarbons which would have been more completely removed had the steam during distillation been passed countercurrent to the direction of gas flow during absorption.

Institution of Gas Engineers' Meeting.—In our report of the discussion on the First and Second Reports of the Ammonia Sub-Committee of the Institution of Gas Engineers, which took place on Nov. 14—see Supplement to "JOURNAL" for Dec. 4—we gave the remarks of "A Speaker." At the time we were unable to ascertain the speaker's name, but have since learned it is Dr. G. E. Foxwell. The remarks in question will be found on p. 52 of the Supplement.

PERSONAL.

At a meeting of the Gas and Water Committee of the Devizes Corporation on Dec. 9, a minute was recorded, in the form of a resolution by the Committee, expressing the value and appreciation of Mr. W. J. RENDELL BAKER'S services rendered during the last thirteen years as Engineer, Manager, and Secretary. Mr. Baker is retiring at the end of the month.

Sir GILBERT C. VYLE has been re-elected President of the British Engineers' Association for the year 1929-1930.

OBITUARY.

HENRY S. KNIGHT.

Mr. Henry S. Knight, a prominent and popular Gas Engineer, and the General Manager of Messrs. R. & J. Dempster, Ltd., of Manchester, died suddenly in a nursing home, in his 58th year, leaving a widow, son, and daughter.

Mr. Knight was a native of Bristol, and after a roving experience he became associated with Messrs. West's Gas Improvement Company, Ltd., for a short period, after which he joined Messrs. R. & J. Dempster, Ltd., whom he served for upwards of thirty years.

He was in close touch with the late Carl Dellwik in the earlier years, and was responsible for much pioneer work in linking blue water gas and coal gas, and later developed the carburetted water gas appliances and plant that were erected by Messrs. R. & J. Dempster in various parts of the world. In the first years of the war the energies of the staff and works of "R. & J. D." were devoted to the production of hydrogen gas, and, under the direction of Mr. Knight, the Government erected plants for the Royal Navy and Air Services both in this country and abroad. It is significant that the airships now undergoing trials are filled with hydrogen produced by "Dempster" plants.

He was an enthusiastic believer in the waterless gasholder, and lived to see his dreams in that direction fully realized. Under his management the spiral holder was developed and popularized largely owing to improvements introduced by the Company with whom he served.

During the post-war period Gas Plant Works has been reconstructed and equipped in accordance with modern requirements, for it was his belief that progress lay in the introduction of modern plant and methods. In addition to the production side, the alterations included a works canteen, together with recreation room for social and educational purposes; and a sports ground was provided and equipped for "all-season" uses. He was associated with, and also a Director of, other industrial concerns in close touch with gas engineering, all of whom will feel the loss of his advice and the forcefulness of his personality.

He was a prominent and popular Freemason, and his work in this direction was recognized by the honour of P.G.D. in the East Lancashire Province.

There was a large attendance at the service preceding the interment, and, excluding the general attendance of his associates and workmen, there were many present connected with the industry, including Mr. F. West, O.B.E., and Mr. W. J. Smith, of Bolton, representing the Institution of Gas Engineers; Messrs. Townsley, Brabbs, Holt, and others of the Manchester District Institution of Gas Engineers; with representatives from Messrs. Clayton, Sons, & Co., Ltd., W. C. Holmes & Co., Ltd., Drakes, Ltd., F. C. Sugden & Co., Ltd., Newton Chambers & Co., Ltd., Donald Macpherson & Co., Ltd., Robert Dempster & Sons, Ltd., of Elland, of the Society of British Gas Industries; and Mr. J. Le Boutillier of the Waterless Gasholder Company, Ltd.

On Sunday, Dec. 15, an impressive Memorial Service was held at St. Luke's Church, Miles Platting.

NATIONAL GAS COUNCIL CENTRAL EXECUTIVE BOARD.

The Central Executive Board of the National Gas Council met on Tuesday, Dec. 10—Sir DAVID MILNE-WATSON, LL.D., D.L., in the Chair.

COAL.

Attention was drawn to an announcement in the Press, purporting to be a conversation with the President of the Board of Trade, in Edinburgh, in which it was stated that "all parties recognized that they could not continue to sell coal to public utility enterprises like gas, electricity, railways, and other undertakings either at a loss or at an unremunerative level. In practice that meant that the depressed coal industry was subsidizing forms of enterprise which, under legislation, had power to vary their charges to the public to produce a certain return. He had every reason to believe that these public utility enterprises recognized the position, and that they would co-operate with the coal industry in reaching agreement."

The Chairman reported the steps which had been taken to ensure that the views of the gas industry on this question were put before the President of the Board of Trade and the Minister of Mines. It was further emphasized that the gas industry was entirely opposed to the fixing of minimum prices, and in particular to the proposal to differentiate in treatment between the different classes of coal consumers.

"NORTHUMBERLAND" CLAUSE.

It was reported that in July, 1928, the local authorities of Norwich, Great Yarmouth, King's Lynn, and Ipswich had applied for very large extensions of their existing electricity area, and that application for the "Northumberland" Clause had been made by the Gas Companies concerned, and these applications had been considered at a local inquiry held at Norwich.

The Electricity Commissioners had now made the Order in respect of the Great Yarmouth Electricity Undertaking, though they had not yet made the Orders in respect of the other local authorities. The Electricity Commissioners, in spite of the fact that the Corporation of Great Yarmouth had agreed to accept the Clause, had declined to insert it in the Order, primarily on the ground that the extremely extensive area for which the Corporation were applying had been cut down to a few villages within five miles of their existing area.

The Board decided that, in a matter of such importance to the industry, it was desirable that every possible step should be taken to safeguard the position.

RAILWAY WAGONS.

It was reported that the Transport Committee of the Council had met that morning to consider the Report of the Standing Committee on Mineral Transport, and it was decided that a further Memorandum, stressing in particular the necessity for more definite provisions regarding the methods by which the cost of adapting private sidings to 20-ton wagons was to be met, should be prepared and forwarded to the Standing Committee.

COMMITTEE OF INQUIRY INTO FINANCE AND INDUSTRY.

Members were reminded that, at the previous meeting of the Board, Mr. William Cash had been appointed to give evidence before the above Committee on behalf of the gas industry. A communication from the Committee was considered, asking the Council to submit a Memorandum on the points which the industry desired the Committee to consider; and a small Sub-Committee was appointed to ascertain the views of the industry in regard to this matter.

COMMITTEE ON DEATHS FROM GAS POISONING.

It was reported that, since the previous meeting of the Board, further evidence had been given before the Departmental Committee by Sir Maurice Craig, Mr. Norris, Mr. Arthur Valon, and Mr. Shelley, of the Ministry of Health.

Further evidence was being given on behalf of the Council by Mr. Thomas Hardie, Mr. Stephen Lacey, and Mr. H. D. Madden; and it was understood that the Departmental Committee hoped to have completed their Report by the end of the year.

INTERNATIONAL ILLUMINATION CONGRESS, 1931.

Mr. Frank Jones (Vice-Chairman of the Council) was nominated to serve on the General Council of the above Congress, to represent the National Gas Council, in addition to Sir David Milne-Watson.

FEDERATION OF BRITISH INDUSTRIES.

The following representatives were re-elected to represent the Council for the ensuing year:

Main Group 9, Sub-Group 1, Grand Council.
Chemical Fertilizers and Explosives.

Mr. C. F. Botley.
Mr. Thomas Hardie.

Main Group 14, Sub-Group 3, Grand Council.
Public Utilities.

Mr. F. J. Bradfield.
Mr. F. W. Goodenough.
Mr. L. E. Clift.

"INSTRUCTIONS FOR FIXING GEYSERS."

It was reported that the booklet originally issued by the National Gas Council in 1924 under the above title had now been revised, and the Board approved publication of the brochure in the revised form, subject to certain further amendments.

A REVIEW OF THE KOPPERS "C.A.S." PROCESS AS APPLIED TO BRITISH CONDITIONS.

By E W. SMITH, D.Sc., F.I.C.

The Ammonia Committee of the Institution of Gas Engineers have, during the past two years, been reviewing various methods for improving the economic position of bye-product ammonia recovery. As a contribution to these deliberations, Dr. Heinrich Koppers has, at the suggestion of the Ammonia Committee, given in the pages of the "JOURNAL" (Dec. 4, p. 643) an account of recent developments which have been made in Germany on this subject. The claims which are made for the process described by Dr. Koppers are so far-reaching and fundamental as to merit the very closest consideration.

It would have been more convenient had this latest development been available for discussion during the Ammonia Sessions of the Autumn Conference of the Institution. The matter is of such outstanding importance that the alternative course has been taken of presenting this review in the hope that others will also contribute to the discussion.

The "C.A.S." process has been devised for the removal of ammonia, hydrogen sulphide, and cyanogen compounds from coke oven gas, with the recovery of ammonium sulphate and sulphur. In his article, Dr. Koppers pays full acknowledgment to previous workers—notably Feld. The process does not depend on the novelty of the chemical reactions involved, as these are well-known.

At the conclusion of his article, Dr. Koppers summarizes the advantages of the "C.A.S." process, and states how the difficulties of the Feld process have been overcome. This review of the process may perhaps best be grouped round these several points

(1) HYDROGEN SULPHIDE REMOVAL.

It is claimed that the gas can be *completely freed* from hydrogen sulphide in the "C.A.S." process. One of the stages of the process involves washing the gas with a suspension of ferric hydroxide in an alkaline solution, and the subsequent revivification of the solution by blowing air through it. This particular stage is in large-scale application in America and elsewhere. It is a most successful method of removing hydrogen sulphide, but unfortunately it will not remove sufficient hydrogen sulphide to comply with English tests. For some years now this particular method of removing hydrogen sulphide has been before the British gas and coking industries, the main limiting factor being that at the end of the process oxide boxes have to be installed to the extent of probably 33 to 50 p.ct. of normal capacity to take out the last few grains of hydrogen sulphide. The stringency of testing for hydrogen sulphide varies considerably in different countries. In England it is particularly severe. As the result of many years' study of the subject of liquid purification, I find it very difficult to accept that the washing solution employed in the "C.A.S." process passed down a hurdle scrubber will remove 100 p.ct. H_2S to English standards. Consequently, as a means of enabling the British coking industry to supply purified gas to the gas industry's requirements, the process by itself would be entirely inadequate. As a substitute for oxide purification in the gas industry, similar limitations would apply.

(2) ELIMINATION OF THE USE OF SULPHURIC ACID.

The elimination of the use of sulphuric acid has been the goal of many an inventor in connection with bye-product ammonia recovery. Let it be stated at the outset of this section that the process is not being disputed. I have no doubt at all that the "C.A.S." process can successfully produce ammonium sulphate by the reactions named; but it is the economics which must be carefully considered. It must be remembered that, however complicated or simple the process employed, ammonium sulphate is ultimately produced by the combination of an SO_4 radicle with two NH_4 radicles.

To claim the *saving* of 1 ton of 144° Tw. sulphuric acid per ton of sulphate made may be quite fallacious if the SO_4 radicles which have to be supplied from elsewhere *cost* (say) twice as much as in the form of H_2SO_4.

Considered strictly from the viewpoint of Great Britain, the following facts should be remembered:

(1) There is already a very simple and reliable process of making ammonium sulphate in a single piece of apparatus, known as a saturator.

(2) There is, at present, a ready market for any sulphur extracted from gas, in the form of spent oxide.

(3) As the result of the great development of sulphuric acid plants during the war, and the growth of the smelting industries, there is a surplus of sulphuric acid in Great Britain.

(4) For the operation of the "C.A.S." process, the following equipment is necessary (all of which is replaced by a saturator and neutralizer in the process of semi-direct recovery with H_2SO_4 devised by Dr. Koppers, which has had such world-wide success):

(*a*) Ammonia concentration plant.
(*b*) Four hurdle scrubbers.
(*c*) Final scrubber.
(*d*) Aerating apparatus.
(*e*) Sulphur dioxide production plant.
(*f*) Sulphur dioxide reaction vessel.
(*g*) Filter press.
(*h*) Sedimentation plant.
(*i*) Pressure decomposer.
(*j*) Vacuum evaporator.

It may be claimed that all this apparatus is not required for the production of the SO_4 radicles, but the fact remains that a complete, balanced process is necessary, or the whole scheme falls to the ground. That is, unless cyanide be removed in the early stages, or excess sulphur removed in the later stages, the chemical balance would be upset.

Expressed briefly, the coke oven plant or gas-works which operates the "C.A.S." process really enters into competition with the sulphuric acid manufacturer in the production of SO_4 radicles. On a small-scale plant he has to compete with large-scale plants.

Without wishing to convey the impression that sulphuric acid is being sold at rock bottom prices in Great Britain, I believe that the SO_4 radicle as purchased in H_2SO_4 is the cheapest form in which it can be obtained in Great Britain to-day, and I am convinced that, taking all costs into consideration, the SO_4 radicle produced by the "C.A.S." process, if operated in Great Britain, will be more expensive than the SO_4 radicle purchased on the open market as H_2SO_4.

(3) ADDITIONAL YIELD OF 10 P.CT. OF AMMONIUM SULPHATE.

This is probably put down by Dr. Koppers merely as an indication rather than a scientific fact. The basis of this is presumably that the nitrogen present in the form of cyanides is approximately 10 p.ct. of the nitrogen present in the form of ammonia.

There is, however, one very important factor to remember when looking at the "C.A.S." process as a large-scale commercial operation. The process involves, among others, two stages:

(i.) Production of concentrated ammonia solution containing 10 to 12 p.ct. of NH_3.

(ii.) Washing of gas with this solution in hurdle scrubbers.

The subject of liquid purification by ammonia has been dealt with in a special report to the Ammonia Committee ("Liquid Purification by Ammonia," E. W. Smith). The work at Birmingham, extending over some years, conclusively showed that, wherever concentrated ammonia is used as a washing medium, losses to a greater or less degree are inevitable. The more concentrated the solution, the greater the losses. We limited ourselves to a solution containing 3 to 4 p.ct. of NH_3 mainly for this reason. Thus, on a large scale, a gain of 10 p.ct. by conversion of HCN to ammonium sulphate might very well be entirely eliminated by losses of NH_3 during the concentration and washing stages. The chemical engineering knowledge of this subject has undoubtedly improved during the past few years, but the point I wish to make is that conversion of HCN to $(NH_4)_2SO_4$ does not *necessarily* mean a higher yield in pounds of sulphate per ton of coal carbonized.

(4) CHEMICAL ENGINEERING ASPECTS.

In both the gas and the coking industries ammonia is a *bye*-product, and, as the word signifies, should not demand the main engineering attention of the works staff. Simplicity and reliability of process are, therefore, two fundamentals. This has undoubtedly been one of the main factors in support of solid oxide purification for the removal of H_2S. Similarly, complete reliability and simplicity are to be found in the operation of sulphuric acid saturator process for the manufacture of ammonium sulphate.

Without in any way questioning Dr. Koppers' assertions that corrosion troubles with polythionates have been eliminated by the use of special metals, it would seem that the "C.A.S." process will throw on the works staff extra engineering supervision. Even at the present day, ammonia concentration plants, sulphur burners, filter presses, autoclaves, and vacuum evaporators are added burdens to the plant manager, which have to show counter-balancing savings to be justified.

To sum up, I would like to make the following points:

(*a*) There is no reason to doubt that the "C.A.S." process is capable of being worked technically satisfactorily.

(*b*) I am of the opinion, looking at it from the point of view of a member of the Ammonia Committee, that the pro-

cess will not enhance the value of NH_3 in the carbonizing industries.

(*c*) The "C.A.S." process is not satisfactory for the removal of H_2S to comply with British standards.

(*d*) Even if the process as a whole could have shown a financial advantage on paper, I consider that the chemical complication and specialized technical supervision render the process unsuitable for British practice.

(*e*) Lastly, the apparent discrepancies between my views and the claims made by Dr. Koppers may be explained by the differences between British and German conditions and practice.

THE BURKHEISER PROCESS.

In the discussion, at the Autumn Meeting of the Institution, on the Burkheiser purification process, reference was made by Dr. A. Parker ["JOURNAL" Supplement, Dec. 4, p. 50] to investigations which have recently been made by Dr. Ernst Terres and Alfred Heinsen at the Brunswick Technical University. The work referred to was fully reported by the authors in "Das Gas- und Wasserfach" for Oct. 12, 19, and 26. In a summary, they stated that the oxidation of ammonium sulphite and bisulphite solutions by gaseous oxygen had been examined from a kinetic basis, first by maintaining constant the activated mass of the salt to be oxidized, and in another case, with ammonium sulphite, by maintaining constant the activated mass of the oxygen. Measurements of the velocity of the reaction showed that, with both the sulphite and the bisulphite solutions, the velocity of the oxidation diminished rapidly with increasing degrees of concentration, which shows that obviously only the portion of the salts dissociated in solution enters primarily into the reaction.

In the case of the sulphite, the temperature coefficient of the reaction velocity is very low, but it is considerably higher for the bisulphite, especially in greater degrees of concentration, in which the increased dissociation due to rise in temperature has a particularly beneficial effect. A concentrated ammonium bisulphite solution is therefore more suitable for oxidation at temperatures up to 50° C. than a neutral sulphite solution. Above 50° in concentrated bisulphite solutions a conversion to ammonium sulphate sets in, with an intermediate formation of thiosulphate. For the oxidation of ammonium sulphite solutions no particularly effective catalysts have been discovered, but additions of lead salts were found to increase the oxidation velocity by some 10 p.ct.

The investigations showed that the reactions in relation to the oxygen entering into them are monomolecular. On the other hand, it was shown that two molecules of ammonium sulphite react with one of oxygen. As regards the Burkheiser process, the conclusion may be drawn that the formation of ammonium sulphate would be favourably influenced by oxidation of the acid solution. It may further be inferred from the experiments that the desired oxidation might well be carried out in the acid solution, inasmuch as the conditions are very favourable for the degrees of concentration which came into question in respect of the partial pressures of the solutions as regards ammonia and sulphurous acid. The formation of the Burkheiser salt is fully explained by the results of the investigations.

PRACTICAL APPLICATIONS.

Enlarging on some of these points, the authors state that their findings as to the relationship between the concentration of the solutions and the rapidity of oxidation are of particular interest for the Burkheiser process, since it has to deal only with concentrated or saturated solutions. Of main importance is the finding that even acid solutions of ammonium sulphite—*i.e.*, ammonium bisulphite—can be almost as readily oxidized as neutral solutions, and that at higher temperatures the oxidation of concentrated acid solutions is considerably greater than that of concentrated neutral solutions. In this case the retarding influence can be diminished by an increase of temperature, which, however, must not be so high as to give rise to any considerable dissociation of the ammonium bisulphite into sulphate and sulphur. A further conclusion may be drawn that, from the point of view of quantity, the production of ammonium sulphate by the Burkheiser method is greater by the acidifying than by the neutralizing process, and the formation of the Burkheiser salt is thus fully explained.

The further conclusion may be drawn that the desired oxidation in the process must be carried out in acid solution, and in this connection it is an advantage that the concentrations which came into question have practically no partial pressure of ammonia and sulphurous acid up to 40° or 50° C., and so any losses of these due to the passage of air can only be very slight, and will probably be negligible.

A modification of the process may be suggested, which would lead to the formation of solid ammonium sulphate by oxidizing the acid bisulphite solution to bisulphate, which could then be used as a wash. The ammonium sulphate solution remaining after neutralization would then have to be re-saturated with SO_2, and used for washing, when again a sulphate-sulphite solution would result, which, after acidification, would immediately be oxidized, before being returned to the process. By this alternating treatment of the wash, the recovery of exclusively ammonium sulphate should be possible.

RECOVERY OF AMMONIA BY THE SEMI-DIRECT PROCESS.

By Dr. G. E. FOXWELL.

In the following, the author discusses Dr. Parker's Section of the Second Report of the Ammonia Sub-Committee, presented at the Meeting of the Institution of Gas Engineers on Nov. 14.

Dr. Parker has given a careful and valuable account of the indirect process, but those portions of his paper which refer to the direct and to the semi-direct process need amplification.

The problem of selecting the best system of ammonia recovery for gas-works is complicated by many factors, one of the most important of which is the small size of the majority of gas-works, making it impossible to employ more staff or more highly skilled staff than are ordinarily required for the normal operation of the plant. The position, of course, is different with a large gas-works, which can afford to instal quite an elaborate process, because the cost of the more skilled supervision is spread over a correspondingly larger quantity of sulphate. This consideration renders it difficult to apply to any but the largest gas-works processes having for their object the elimination of sulphuric acid, and renders it advisable rather to examine the simpler standard processes such as those forming the subject-matter of Dr. Parker's paper.

It is not my present purpose to discuss at length the relative merits of what are termed the "direct" and "semi-direct" systems, but it is necessary to point out that it is of cardinal importance in the direct process that the temperature of the gas shall not fall below its dew-point until after passing through the saturator. With the widely varying outputs experienced upon gas-works, there is bound to be difficulty in keeping the temperatures sufficiently high during times of minimum load; the temperatures are also affected to some extent by the atmospheric conditions. This fact, coupled with certain other disadvantages, appears to render the direct process definitely less suitable for sulphate of ammonia manufacture in gas-works than the semi-direct process.

SEMI-DIRECT PROCESS.

The manner in which the semi-direct process is worked at the present time is briefly as follows:

The gases issuing from the retort or coke oven are subjected to a spray of liquor in the hydraulic mains, whereby their temperature is reduced to between 80° and 100° C. and the mains are kept free from tar or pitchy deposits. The gases are thereby freed from the heavier tar (excepting tar fog) and from ammonium chloride, and are led by an air-cooled main into the condensers. The temperature is here reduced by coolers of the usual type to as near atmospheric temperature as possible—not, as Dr. Parker states, "from 25° to 45° C." The gases then pass through the exhauster and through a tar extractor to eliminate tar fog, and are then passed into the saturator, where the ammonia is almost completely removed from the gas by a slightly acid solution of sulphate of ammonia. The ammonia in the gases leaving the saturator need not be more than 3 grammes per 100 cub.m. (1·3 grains per 100 c.ft.), but can be modified from this figure if desired by alterations in the method of working. As the process was originally designed, the gases before entering the saturator were preheated by exhaust steam to 65° C., but later experience with this process has indicated that the degree of preheating need not be anything like so high as this, though the preheater is of great assistance when the plant is operating upon low output.

The ammonia may be recovered wholly as sulphate, or, if

desired, the still may work into a condenser, thus manufacturing ammonia liquor of 15 p.ct. strength, while the "free" ammonia left in the gas is converted into sulphate. The relative quantities of ammonia condensed with the liquor and passing forward with the gas vary considerably with the nature of the coal charged into the oven or retort, its chloride content, and its water content. As a generalization, however, it is correct to say that between one-third and one-half of the total ammonia passes into the saturator direct without going through the stills.

Dr. Parker condemns both the direct and the semi-direct processes, because, to quote his own words, "a saturator of usual design cannot be operated successfully with gas flows much greater or less than the rate for which it was intended. . . . With low rates, salt deposits on the curtain plates of the saturator, and causes stoppages."

Dr. Parker repeats this criticism when dealing with the semi-direct system. It can be definitely stated that in this respect he is misinformed. If the saturator is operated in a properly skilled manner, there is no difficulty in working successfully with considerable variations in output. Records which happen to be available to me of certain gas-works serving villages and rural communities show that the coal carbonized during the minimum summer month as compared to the maximum winter month is in the proportion of 1 : 1·75; records published of other works appear to indicate that about 1 : 1·8 may be taken as an average ratio for the normal variations in large towns. I have a record of a coke oven plant which happens to be supplying gas to a neighbouring town in which observed monthly variations in output have been 1 : 2·3 without the slightest difficulty having been experienced in operating the saturator. It must be taken as a fact, therefore, that the trouble anticipated by Dr. Parker will not occur in a properly designed semi-direct plant operated in a reasonably efficient manner.

Operating Costs of Indirect Process.

Dr. Parker has not been able to give the costs of operating the semi-direct process. In the hope that it may be of interest, I will endeavour to supply this information on the basis of a comparison with the costs of the indirect process given in the papers presented to the meeting. The information upon which the cost of the indirect process is based cannot be wholly taken from Dr. Parker's paper, but must be partly sought in the accompanying paper by Mr. Hollings and Dr. Pexton. From this we may deduce the following cost for the indirect process working with 10 oz. liquor.

Hollings and Pexton.

	£	s.	d.
Transport and pumping liquor—2800 galls. at 22s. 3d. per 1000 galls.	3	2	4
Water and steam at gas-works—2800 galls. at 1s. per 1000 galls.	0	2	10
Interest, depreciation, and maintenance—*Storage plant.*—8 p.ct. on a capital cost of £4 per ton of sulphate of ammonia per annum = 2s. per 1000 galls.	0	5	7
Interest, depreciation, and maintenance—*Washers.*—8 p.ct. on a capital cost of £6 5s. per ton of sulphate of ammonia per annum	0	10	0

Parker.

Cost of making sulphate of ammonia as per Table II. of his paper	5	14	5
Total cost of manufacturing one ton of sulphate of ammonia by the indirect process	£9	15	2

to which must be added the cost of neutralizing, bagging, and loading.

The total of these figures is well over the price offered for sulphate of ammonia at the present time.

The two largest single items in the cost of making sulphate of ammonia according to the above table are that of acid (£3 per ton) and of transport and pumping liquor. Hollings and Pexton state that their transportation figure is "an assumed average cost," but in all probability their figure is sufficiently near to the truth to be taken as a reasonable average, though it would be interesting to know whether it was the average for large gas-works situated as those in London, or whether it also includes transportation from quite small works to neighbouring towns, possibly situated some distance away.

Transportation.

We must eliminate either the cost of acid or the cost of transportation if sulphate making is to pay. The Research Committee of the Institution has before it the Feld process, the Burkheiser process, and, recently, the Koppers "C.A.S." process, all of which aim at eliminating the cost of acid. These processes merit the most careful consideration, but it is a purpose of this communication to point out that the principal single cost in the above figures—that of transportation—can be avoided by the use of the semi-direct process.

Perhaps I may digress to point out that the cost of transportation can also be avoided by centralizing gas-making at larger works, so that the smaller undertakings are supplied with gas from large central manufacturing plants. Many economies besides that of transportation of liquor could be secured in this way. To adopt such a policy would be in accordance with the general industrial tendency, which is to concentrate on big installations, so that the smaller concerns are finding it increasingly difficult to work at a profit. It is for the gas industry to decide whether the extra cost of pumping gas will more than counterbalance the economies to be secured by centralization. Personally, I do not think it will.

Returning to the cost of sulphate making, the total capital cost of the washers, storage, and sulphate of ammonia factory, including buildings, as given in the papers by Parker, and by Hollings and Pexton, is £17·5 per ton of sulphate of ammonia made per year.

Operating Costs of Semi-Direct Process.

Passing now to the cost of operating the semi-direct process, it will be found that the capital cost of an exactly similar plant will be somewhat less than the cost of the same sized plant upon the indirect process, because no washers are required. I have unfortunately no figures for very small installations, but for larger plants the following figures may be taken as approximately correct. These comprise all pumps, including those for circulating liquor through the mains, storage for sulphate of ammonia and liquor, sulphate house buildings, and all plant for the manufacture of sulphate of ammonia, but not neutralization. The capital costs are as follows:

Capacity of Carbonizing Plant.	Capital Cost per Ton of Sulphate of Ammonia per Year.
Coal carbonized per day.	£ s. d.
3000 tons	5 10 0
400 ,,	15 0 0

Both these installations, it may be remarked, are for the most modern type of plant, and may, therefore, be proportionately more expensive than those quoted by Dr. Parker. For the purpose of estimating depreciation, &c., the figure taken will be £14, which is £3 per ton of sulphate more than the figures quoted above for the indirect process *less* the cost of the washers. In order to bring these figures on the same basis as those considered previously, the actual production of sulphate of ammonia has been calculated as the maximum capacity of the plant working for 200 days per year. As in the case of Dr. Parker's figures, the costs do not include neutralization, bagging, or loading.

In calculating the following table, wherever possible the same figure has been taken as those given by Parker, or by Hollings and Pexton.

A.—*Horizontal Retorts and Coke Ovens.*

According to Parker's figures, the liquor produced is 21·2 gallons per ton of coal, or 1900 gallons per ton of sulphate of ammonia.

	£	s.	d.
Acid—1 ton of 144° Tw. B.O.V., at £3 per ton	3	0	0
Lime—238 lbs. (96 p.ct. CaO), at £1·75 per ton	0	3	9
Steam—One-third of 1900 galls. = 2·83 galls., at 4s. per ton	0	11	4
Maintenance, depreciation, &c., 10 p.ct. on cost, £14	1	8	0
Labour, supervision, &c.	0	16	0
Pumping of liquor, including circulation of liquor and spraying in main	0	6	0
	£6	5	1

B.—*Vertical Retorts.*

Liquor produced 36·5 gallons per ton of coal carbonized = 3270 gallons per ton of sulphate of ammonia.

	£	s.	d.
Acid—1 ton of 144° Tw. B.O.V., at £3 per ton	3	0	0
Lime—238 lbs. (96 p.ct. CaO), at £1·75 per ton	0	3	9
Steam—One-third of 3270 galls. = 4·87 tons, at 4s. per ton	0	19	6
Maintenance, depreciation, &c., 10 p.ct. on cost, £14	1	8	0
Labour, supervision, &c.	0	16	0
Pumping of liquor	0	8	0
	£6	15	3

These figures show that, whereas, according to the figures of Parker, and Hollings and Pexton, it is not possible to make sulphate of ammonia at a profit by the indirect process as operated at gas-works, it is possible to make it at a profit by the semi-direct process. There is no difference between the cost of making gas by the indirect process or by the semi-direct process, because the gas in both cases is cooled to atmospheric temperature, so that the exhauster has to deal with exactly the same volume under the same conditions. There are no technical reasons concerned with the working of a sulphate of ammonia plant which need prevent its adoption at gas-works, and, indeed, many semi-direct plants are actually in operation at gas-works in America and on the Continent. I may instance the Budapest Gas-Works, where a semi-direct plant is treating gases from a plant carbonizing a maximum of 780 tons of dry coal per 24 hours.

Finally, I should like to comment briefly upon Dr. Parker's conclusions given at the end of his paper:

(1) It is stated that the direct and semi-direct processes are not flexible in that they can only produce sulphate of ammonia. Though this is true of the direct process, I have shown that it is only partly true of the semi-direct process.

(2) It is stated that it is not so easy to produce sulphate of ammonia of a uniformly high quality by the direct and

semi-direct processes as by the indirect process. To this, those accustomed to operate these processes upon coke oven plants would give a decided negative. There is no difficulty in making sulphate of ammonia of the highest quality by the semi-direct process.

(3) Dr. Parker does not consider that there is any financial advantage in the semi-direct and direct processes over the indirect. On the basis of the figures worked out in the preceding communication, it must be agreed that the difference in costs in favour of the semi-direct and direct shown by my calculations is principally due to the elimination of transport and storage. Nevertheless, since these are, according to Hollings and Pexton, essential costs in the manufacture of sulphate of ammonia at gas-works by the normal method used to-day, it must be pointed out that the actual saving is sufficient to turn a considerable loss into a reasonable profit.

(4) The semi-direct process would not, as stated by Dr. Parker, require modification for installation at a gas-works provided that the gas-works were of a reasonable size. It must, however, be open to some question whether a semi-direct process would be economical on a small gas-works; but, indeed, no sulphate of ammonia process so far devised would appear to have any prospect of being an economical proposition on a small gas-works at the present time, and I would, therefore, again draw attention to the economies to be derived from the centralization of gas-works which might employ large carbonizing units with the consequent saving in labour and other charges.

IMPROVEMENTS IN THE SEALING ARRANGEMENTS OF WATERLESS GASHOLDERS.

The waterless type of gasholder is taking up a good deal of the attention of gas engineers at the present time, as is indicated by the many references to it in the Technical Press; and we have had brought to our notice a new type of sealing arrangement which seems to be a notable advance.

The essence of efficiency in connection with the waterless type of gasholder is undoubtedly the arrangement for sealing the gas from escape into the upper space above the piston, where it could readily form an explosive mixture if the escape was of a serious character.

To secure a perfect seal, great flexibility and perfect lubrication are required; and to obtain working economy of the seal, it is necessary that the pumping of the lubricant should only be occasionally required.

The seal we are about to describe seems to embody these features. Fig. 1 illustrates the general principle, and fig. 2 shows an enlarged view of the sealing portion, to enable a better idea of this to be obtained.

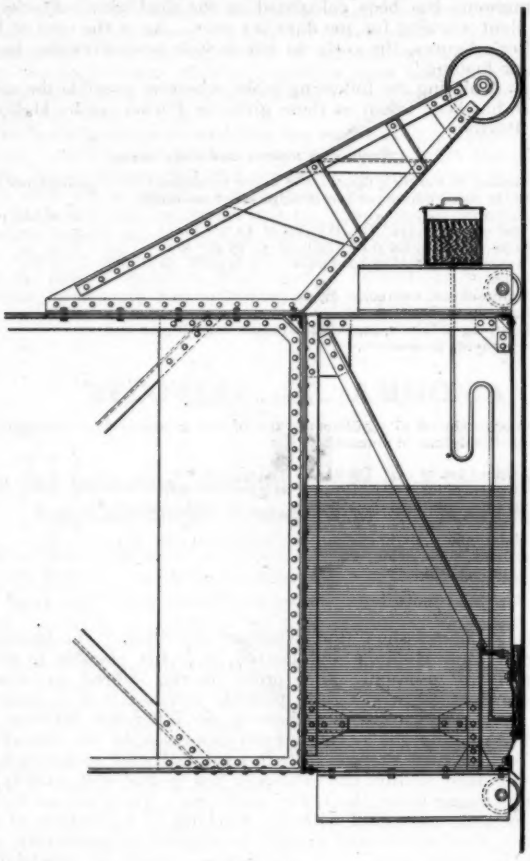


Fig. 1.

Fig. 1 represents a section of the outer portion of the piston of a waterless gasholder, which is in the form of an annular tank and can be filled with water or other liquid. Near the bottom of this annular tank and on the outer surface is a continuous opening all round the circumference, which is covered in by a flexible diaphragm of canvas, leather, or other suitable material of a waterproof character, secured as shown to the edges of the opening. This flexible diaphragm is provided with suitable outer rubbers secured by bolts to the diaphragm, or which could be sewn thereto; and these rubbers may be of leather or asbestos with wire insertion so as to give long wearing qualities.

It will be noticed that, if the annular tank of the piston is filled with water, the pressure of the latter will naturally bulge the canvas out, causing the rubbers to bear on the shell of the gasholder; the pressure depending upon the depth of water. The space between the two rubber pads can be filled either with thick grease supplied from a pressure gun by means of the pipe shown thereon, or it can be automatically connected with a series of supply tanks on the top of the piston, and prepared tar or lubricating oil connected thereto, thus securing that this space is always efficiently provided with lubricant. In addition to this, the space between the piston and the shell of the holder above the diaphragm can be filled with prepared tar or oil, to give additional lubrication for the piston movement.

To ensure that the space between the piston and the shell is uniform for all positions of the former, certain guide rollers are provided at the top and the bottom of the piston running up the shell, and in addition to these a suitable number of extended guide rollers is also provided to prevent any tendency for the piston to tilt out of level.

The advantages claimed for the above are:

(1) Perfect flexibility of the sealing diaphragm over the whole points of circumferential contact.

(2) Pressure of rubbers readily varied by increasing or decreasing the depth of water.

(3) Gasholder pressures secured by water rather than by concrete blocks.

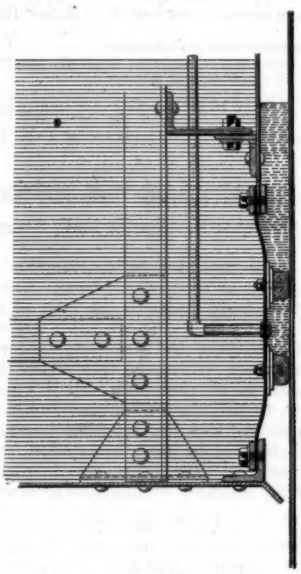


Fig. 2.

(4) Ease of examination, and replacement at a reasonable cost, of the canvas or rubbers whenever this may be required.

(5) Cleanliness of the renewal process in the event of water and oil only being used.

(6) Reduction in initial costs.

(7) Freezing of water or tar can be prevented by the usual method of anti-freezers.

The Patentees of the above arrangements are Messrs. Firth Blakeley, Sons, & Co., Ltd., of Vulcan Ironworks, Church Fenton (Yorks).

SERVICE TO THE CONSUMER.

West Riding of Yorkshire District Conference of the "B.C.G.A."

A well-attended West Riding of Yorkshire Conference of the British Commercial Gas Association was held on Thursday of last week at Huddersfield, under the Presidency of Alderman R. MITCHELL, J.P., Chairman of the Huddersfield Corporation Gas Committee.

The conference took place in the Council Chamber of the Town Hall, where, on assembling, the visitors received a hearty Yorkshire welcome from the MAYOR OF HUDDERSFIELD (Alderman W. T. Priest, J.P.).

This was acknowledged by Mr. W. M. MASON (Manager of the British Commercial Gas Association), who remarked that Sheffield, Huddersfield, and like industrial centres were the places in which the gas industry showed its bright spots, in helping to solve the great problem of smoke nuisance.

The PRESIDENT said he was glad to see so representative a gathering. Such conferences were necessary, as they should all be working on common ground for the good of the industry. He then called upon Mr. H. Singleton to open a debate.

SERVICE TO THE CONSUMER.

By H. SINGLETON, Engineer and Manager to the Huddersfield Gas Department.

Service to the consumer commences at the works. This service is to supply gas of a constant composition, regular calorific value, and adequate pressure. Without this, after-service is useless. After-service involves the maintenance of mains of sufficient capacity to meet the recurring heavy demands which are now so common with cooking, gas fires, and wash-boiler consumers. In a municipal undertaking the gas service is to the consumer only, there being no other interest to serve. The service to the consumer must be efficient. We exist for service. Gas service means making gas available at any time for any purpose, whether domestic or industrial, at the lowest possible price, with efficient appliances, and with speed in attaining results.

SHODDY APPLIANCES.

We must not sell, and we must discourage others from selling, shoddy appliances; not only lighting, but every form of shoddy appliance. This must be done by selling or supplying a sound reliable article at slightly over cost price. I do not believe in giving anything free of charge except labour. Our policy has been to hire out cookers of the cast based, black type only. Any other appliances may be had on hire-purchase terms spread over three or five years. Up to the present we have not extended the simple hire system to gas fires, but I am strongly in favour of hiring gas fires of a substantial general type. We cannot exist under the present highly competitive conditions by simply supplying gas to the consumer's meter and being content for other people to look after his special interest and satisfaction; otherwise we lose consumers before we are aware that they are dissatisfied.

MAINTENANCE.

We have been giving free maintenance of supply for just over two years. The maintenance fitter carries a case containing 1 dozen universal mantles, half-a-dozen bijou mantles, three "C" mantles, and four medium mantles, all sold at fourpence each, and of a very strong and serviceable type—namely, 3 or 4 ply loom-woven mantles. He also carries one universal inverted burner, one inverted angle burner, one bijou angle burner, one ordinary bijou burner, one upright "C" burner, and two superheaters for conversion of universal burners. On checking the sales of the lighting fittings and smalls made by these fitters during their visits, I find the amount received averages 50s. each fitter per week, on which sales we have 20 p.ct. profit. This is quite apart from the substantial inquiries which they get for cookers, fires, wash-boilers, &c.

The maintenance fitters make free replacements of parts in appliances belonging to the Corporation, and report for exchanging any such appliances which cannot be put in order on the spot. Replacement of parts of consumer's own appliances are made at net cost of the parts with free labour. The number of houses visited per day averages six, and, though I have heard of much better averages, I am perfectly satisfied if only this number is done well, and, given the necessary time to do each job, there is no excuse for indifferent work. We are working towards the ideal of at least one visit per consumer per annum by the maintenance fitters as soon as we have a sufficient number of well-trained staff to cope with the work. We have 48,000 consumers, and I suggest that with 26 maintenance fitters and one foreman, one visit per annum could be guaranteed, though of course I would prefer two. Allowing for one visit per annum, and supplying labour only free, the cost to the Department would be nearly 0·8d. per 1000 c.ft. of gas sold, or 0·16d. per therm. At present we have only eight fitters on this work, and their duties are first to deliver to each consumer a letter addressed to them personally, giving notice of their intended visit so as to guard against imposters making calls. The letter states that the visit is to adjust and overhaul gas appliances and give advice with respect to additional appliances. In this way a great deal can be done by the maintenance fitter in retaining gas lighting, by showing and demonstrating to the consumer the best lighting burners. We find that the majority of consumers who have any complaint will grumble or complain to one another, but there is great difficulty in inducing consumers to send complaints direct to the Gas Department, unless they are compelled and cannot make any use at all of any particular appliance. It is only by prompt and efficient handling of their complaints that their confidence can be obtained, and they become educated to the knowledge that the Gas Department exists to supply and maintain a useful and efficient service for their especial benefit.

One disturbing feature of service to the consumer to-day as compared with pre-war is the cost of the distribution of the gas. The cost of manufacture is slightly over 50 p.ct. higher, but the cost of distribution is over 100 p.ct. higher, owing to the methods of lay-out and the new ideals set up by town planning experts, whereby more than twice the length of main is required to supply a given number of houses, and very often three times as long service pipes for the same supply. This, of course, refers only to the initial cost of installation, but these greater lengths of feed pipes per consumer greatly increase the maintenance cost, and make it much more difficult to give to the consumer that complete service at which we aim.

RETAIN EXISTING CONSUMERS.

One fact which is often lost sight of by canvassers and showroom staff is that it is more important to retain existing consumers than to get new ones, for the simple reason that the expenditure has been made in the case of existing consumers, whereas with new consumers a further expenditure is necessary. Where new business presents itself it is sound policy to get in first, as displacement is always more difficult than obtaining original business.

Every effort should be made to retain and if possible to increase the street lighting load. This load becomes effective when the cooking and most of the industrial load is over for the day. Good street lighting is a standing advertisement for gas, and a proof that gas for lighting purposes is the most effective form of light distribution.

In the showrooms we must exhibit only sound, modern, and efficient appliances, obtainable on the most reasonable and attractive terms. The public should be encouraged by friendly advice and courteous reception on the part of the staff to make the utmost use of our showrooms when considering any domestic or industrial problem which gas is capable of solving. Collectors, fitters, and inspectors are in daily contact with the public, and the manner in which they serve the public is accepted as a measure of the efficient service of the undertaking. They should, therefore, be well informed on all gas matters, and, above all, be enthusiastic and courteous.

DISTRIBUTION OF LITERATURE.

For a number of years we have regularly distributed useful literature with the quarterly gas accounts, and I am satisfied that this is a very cheap and at the same time very effective way of reaching every consumer, however small. The monthly publication, "A Thousand-and-One Uses for Gas," is regularly posted to architects, business firms, and others to whom it applies, and two copies are always sent to the Public Library. Within the last three months I can quote three substantial new consumers as a direct result of the supply of the monthly. One is a gas supply for melting printing type on one of the latest linotype machines. Another is the introduction of gas for lead pipe making, for which a 3-in. main was laid. The third is a furnace job for melting brass for a firm of steam valve makers.

The formation of the Gas Salesmen's Circles has proved to be of the utmost service by the free interchange of ideas connected with the supply and maintenance of gas-consuming appliances. The views of showrooms staffs are broadened, and they are better enabled to tackle the problems with which they are daily confronted in the face of increasingly severe competition.

A great service is being rendered to consumers of all kinds by the well written advertisements which are now regularly appearing in the newspapers, part of which is due to the good work of the "B.C.G.A." and part to the makers of the first-class appliances. Besides placing before the public the case for

gas, they illustrate the wonderful improvements in the appearance—simplicity in working, exactitude in results, and efficiency and economy in operation. For a few years we have been very seriously tackling the problem of the education and training of the outdoor staff. We have had most success with the new apprentices to plumbing and fitting. Additions to the outdoor staff are only engaged fresh from school. When a selection is being made we preferably take on secondary school lads of about 16 years of age. It is a condition of their engagement that they undertake to attend evening schools or the Technical College. The Gas Committee pay the fees of all students who attend regularly, attain reasonable success at the examinations, and perform satisfactory homework. The classes attended are those of the Institution of Gas Engineers—gas supply and gas fitting courses. A number of these students are qualified to sit for National ordinary certificates in gas supply, and we hope eventually they will attain the Higher Gas Supply Certificate. In the Distribution Department they are given opportunities to acquire experience in meter making and repairing, cooker and fire cleaning, dismantling, re-packing and re-assembling. They also spend a good period acting as plumbers' mates, after which they receive about two months' intensive training in the adjustment of every type of lighting, cooking, and heating appliance. If they can then satisfy their instructor they are at once put on the maintenance staff. They attain the age of 19 years before they are sent on the district alone—namely, after three years' training. We have now about twenty of these juniors on various kinds of work, and we are very proud of them; and, what is more, the consumers like them, as they know their job well.

I do not favour the free loan of any kind of gas-consuming appliance; the public do not value gifts. I know in some instances lighting burners have been given away, but I would far rather hire them at 3d. per quarter; the Department would then be asked to maintain them, and could therefore have the continuous oversight of this lighting business on a fairly attractive basis of charge.

I would recommend to gas engineers and heads of distribution departments the two papers read at the Public Works, Roads, and Transport Congress on Nov. 19, entitled "The Arrangement and Economics of a Town Plan," and "The Inter-relation of Public Services and Town Planning." These papers illustrate the trend of housing with particular reference to street arrangements and the development of sites, the supplying of mains and services to which is an interesting and useful study.

The aim of the gas industry for good service is to secure the result of no complaints.

Discussion.

Mr. C. S. Shapley, of Leeds (President of the Institution of Gas Engineers), said the author had told them that the number of houses visited per day was six. This seemed to him a very good figure indeed. It was a satisfactory average for a thorough overhaul. Of course, there was a great difference in houses; and in many cases the gas burners did not receive the consideration from the consumer which they should do. In his own case, the gasfitters who did this class of work were provided with an identification card. These cards were examined periodically, and each one was signed by him and cancelled by him, and they were all numbered. No one would wish to see any more back-to-back houses, of which there were many to be found in Leeds, and he quite agreed with spreading out the number of houses per acre; but it was throwing upon public utility undertakings a very serious burden in carrying supplies to these more widely-spaced houses. This should be borne in mind by the various authorities when the question was raised of providing these services. With regard to new business, he was glad to note the author's remark that it was essential to get in first, though here, again, finance played a part in connection with these new housing estates. They had to consider the cost of getting in first, when the business might be small, as was the case when (say) the only point was for one wash boiler, which would be occasionally used. He (Mr. Shapley) secured quantities of "A Thousand-and-One Uses for Gas," and circulated them; but he had not hitherto thought of sending copies to the Free Library. This was a very good idea, and he had already made arrangements to follow Mr. Singleton in this respect. Certainly, the coming fitters were being trained by Huddersfield in an excellent way. It was essential that they should have the highest type of man for work on the district. They were really at the moment dealing with service as service to the consumer, but he would like to emphasize that service should be carried right through. It should be given to everyone who came in contact with their business in any connection whatever. The remarks he had made regarding the use of the telephone, when speaking at the recent Eastbourne conference, were perhaps not on a new topic, but it was a matter of importance. It was very annoying to a business man to ring up the Gas Department and hear someone say: "Hullo, who is that?" It was much better to reply "Gas Department," and then one was put straight on to the person wanted. On the other hand, if one rang up anybody, it was a good thing to be at the telephone to speak as soon as the line was put through.

The Advertisement of Good Street Lighting.

Turning to another matter, he felt that one of the best advertisements the industry could have was good street lighting; and it was advisable to secure this, even if they had to sacrifice something. Nothing would militate more against the success of the industry than a bad exhibition of gas in this respect. He did not wish to say a word against the electrical industry, which was fulfilling a very useful service; but there was a difference between the two, inasmuch as gas consumers could endure a bad supply, whereas in the other case one either had electricity or none. It was extraordinary to see how many consumers remained satisfied with indifferent appliances. In his own city he had found that builders sometimes did not properly fix fires on housing estates, and the Gas Department now inspected every one put in. A point that had occurred to him was that they might in the future have to consider the advisability of showing these maintenance charges on their accounts; and where they supplied free meters this might also be shown as a separate charge, so as to indicate the cost of gas as a net figure. Maintenance to-day was costing some of them up to 3d. per 1000 c.ft. or more; and this all came as a charge on the price of gas, making the figure—particularly with free meters—look high.

Mr. W. B. McLusky (Halifax) said Mr. Shapley had made a big point when remarking that maintenance cost in some cases 3d. per 1000 c.ft. A thorough visit to a consumer would, he reckoned, cost 2s. 6d.; and if there was one visit per annum, and the consumption was 10,000 c.ft., this would work out at 3d. per 1000 c.ft. But if they put into operation a two-part tariff, thereby inducing the consumer to take 30,000 c.ft. instead of 10,000 c.ft., then the maintenance cost would be only 1d. per 1000 c.ft. With regard to the young men engaged on maintenance work, Mr. Singleton said they knew their job well, and the consumers liked them. This was high praise, and he was doing well to train them in this way. Other references in the paper which had struck him particularly were those to prompt and efficient handling of complaints and to speed in attaining results.

Good Sense.

They must first find their man, and make him a fitter afterwards. The man was the thing. The Ancients had seven sciences in their reckoning, but Pope accounted good sense greater than them all.

> "Good sense, which only is the gift of heaven,
> And though no science, fairly worth the seven."

Good sense in a gasfitter was a great asset to the gas industry. Accumulated knowledge was not enough. The skilled fitter must acquire a knowledge of the requirements of his customer. A fitter with these accomplishments could reduce the consumer's gas bill. A good gas appliance properly adjusted would often effect a greater saving than a reduction in the price of gas. Of course, they wanted to sell gas. They wanted to sell more of it, and they wanted to sell it at lower prices. But if was only by applying gas to its work in the most efficient way that they could make the ultimate cost low enough to satisfy every demand. Service to the customer must not only be good, but quick. The gas itself was quick enough when applied to the work. No fuel was so quick as gas, and no quick fuel was so cheap as gas. Good results followed quick service. The customer who was well satisfied with the results obtained from the use of gas for one purpose would try it for another purpose. Economy in use not only saved the customer's pocket, but increased the revenue of the department. Huddersfield was on the right lines.

Trust.

The cost of maintaining the present service—which he understood was but the nucleus of a larger scheme—was very moderate indeed, less than 1d. per 1000 c.ft. of gas sold. They spent more than this on service to the consumer in Halifax; but their scheme had been in operation for a longer period, and had developed with the years and with the increase in the number of appliances in use. One of the most encouraging results of the work among the customers in Halifax was that their customers trusted the Corporation. They believed what was told them about burners and fittings and appliances, and they bought what the Corporation recommended, knowing from past experience that the Corporation and their servants accepted full responsibility for the results. The importance of retaining existing customers was emphasized in the address, and properly so. The fear of losing a customer acted as a stimulus to fresh effort, and all their customers got the benefit of this fresh effort; but how much happier was the relationship between them and their customers when they rendered the service due without fear. Only proper attention to the needs of customers would establish this relationship. Mr. Singleton was a neighbour and a good friend of his; and it was a pleasure to him to watch the growth and development and increasing usefulness of the Huddersfield gas undertaking.

Mr. H. E. Bloor (York) took it that the real essence of what the author said in his paper was that what mattered to the consumer was the service that he got from the gas. What he bought was not gas but a boiled kettle, a warmed room, or a hot water supply. Therefore the responsibility of the undertaking should be, not the responsibility of manufacturing gas and putting a good supply of it into the mains, but that of maintaining efficient service right through to the satisfaction of the consumer. In York this theory had been adopted. It had been found that the public had a lower idea of the quality of the service which gas could render than the Gas Company themselves knew they could provide if they were given the opportunity. As had just been pointed out, gas might be functioning unsatisfactorily, but it would still go on functioning, whereas electricity was either there or it was not. Gas could continue to give inefficient light or heat, and the mind of the consumer would gradually accustom itself to this as being what gas stood for. It was the realization of this fact at York which led them some years ago to test out the matter. He thought all were agreed that they had now got past the stage of having to argue the advantage of this service to the consumer, though there might still be room for argument as to the extent to which it might be necessary to go. The broad principle was generally accepted that they stood to be judged on the service obtained by the consumer. They could still discuss such things as the number of visits needed to maintain an adequate standard of efficiency. An advantage was obtained even from infrequent visits, in that the con-

sumer at any rate got a refreshed idea of what was possible. He was not prepared to say whether he considered one visit a year sufficient, but it was certainly many times better than no visit at all. The modern science of business depended upon the discovery that service paid—that it paid to give the customer a square deal. It was absolutely essential to convince the customer that he was getting a square deal; and what they were out for was to give him the maximum of satisfaction at the minimum of cost. They must make people feel that they were out primarily to satisfy them. On their success in this would depend the prosperity of the industry in years to come.

THE HOT WATER LOAD.

There was one point which he would like to introduce, though it did not exactly arise out of the paper, and that was whether or not the gas industry was going to add to its business during the next generation the hot water supply of the household. In York, the average consumption per ordinary consumer approached 40,000 c.ft. per annum. They had very little industrial load. The average domestic consumption—taking out all institutions, hotels, &c.—was about 30,500 c.ft.; and the consumption of slot meter users was just under 24,000 c.ft. They had not really up to now done anything with the hot water proposition in the household. They had made efforts with geysers, circulators, wash coppers, &c.; but they had not practically touched the fringe of the problem. He held that the question as to whether or not the gas industry was to be relatively as prosperous twenty years hence as it was to-day might possibly depend upon whether or no the development of the labour-saving idea was going to lead them to the extension of the use of gas for hot water supply on the same scale as that on which they had already tackled the cooking load. At the present moment the gas cooking load for one hour on one day of the week was in many places the cause of an enormous expenditure on distribution systems, because it was the period of maximum demand. There had come into the field now an entirely new system, which put a fresh complexion on the future of hot water supply by gas, and it was an apparatus which offered the possibility of an average annual consumption of perhaps 30,000 or 40,000 c.ft. He referred to the storage hot water system. There were two or three patterns on the market, of which the "Sunhot" was one. This system made an extraordinary appeal to him. The small burner was intended to be kept on during the whole of the twenty-four hours, and consequently it would be burning during the night, when their demand was at the minimum. The system, if it proved as successful as he hoped, presented possibilities of enormous importance to them. It seemed to be highly economical, and it furnished an excellent supply of hot water, so long as the storage was sufficient. Further, it would not involve the increase in size of a single service pipe, or the altering of a single meter or internal pipe. He would like everybody to make investigation as to whether or not there was in this apparatus a possibility of capturing the hot water business. He felt that there was in it promise of great good to the industry, and that was why he had taken the opportunity of bringing it to the notice of the conference.

WAKEFIELD'S INSPECTION SYSTEM.

Mr. C. W. WARD (Wakefield) described the service which was given in his town. He said that two inspectors were employed, and they were followed up by a staff of fitters. Before the inspectors visited a house, a letter was sent to advise the occupier of the intention to call. The inspectors carried cards, and went over all the apparatus. Every appliance was lighted up, and then the pressure at the outlet of the meter was taken. Complaints were recorded on the cards, and brought back to the office, after which they were followed up. The inspectors did not carry fittings; but they did take with them literature. No charge was made for time, but only for materials used.

JOINT RESPONSIBILITY.

Mr. C. R. INGHAM (Brighouse) remarked that what consumers bought was not gas, but the comfort and convenience that gas could give. If they did not obtain this, then the undertaking was failing in its duty to them. It was, therefore, their business to see that every consumer of gas obtained the fullest possible benefit from it, in comfort, convenience, economy, speed, and reliability. The attainment of this desirable end was the joint responsibility of many people; but he would refer only to that of the consumer and of the gas undertaking. With regard to the domestic consumer, was it too much to expect him to take advantage of all labour, time, and money saving appliances he could afford? Could they not also bring him to realize that the gas undertaking's chief aim and ambition was that these appliances should only be used wisely, and that they should be working at their highest level of efficiency? One could hardly expect the average consumer to have special knowledge of gas apparatus. Consequently, when defects occurred, or additional appliances were required, he must call in the aid of the gas department staff, who were only too anxious to rectify these defects, or to give expert advice. In the case of the industrial consumer, the same problems presented themselves on a larger scale. If he desired to introduce any process using gas, he would be wise to consult the gas department officials, who could in many cases give him advice which might save him a good deal of time and money. If any difficulties arose with existing plant, he would receive every assistance from the department. As to the responsibility of the gas department, practically every undertaking to-day realized the fact that its very existence depended on the satisfactory service it rendered to its consumers. By regular inspection of all appliances it was possible to make quite sure that all of them were, at some time during each year, in perfect working order. It was a fact, however, that a large number of appliances which were in first-class order must be inspected, to ensure that all defective ones received attention. If consumers would notify the gas undertaking of any apparatus which needed attention, all the necessary inspection would be eliminated, and a great deal of money would be saved annually, all of which could be devoted to reducing the price of gas, and thus improving the service offered. Unfortunately, when defects occurred in connection with domestic gas appliances, the consumer did not realize that there was anything wrong, or he omitted to inform the department. If they could only induce people who used gas to understand the high performance these appliances could give, to expect and be contented with nothing but the best, and to report to the gas undertaking any deficiency, then they could give the consumer the highest possible service at the lowest cost.

Mr. T. WENT (Leeds) said that when they started on house-to-house inspection of all appliances at Leeds, they did not consider youths of 19 years capable of doing the work. It was agreed that the best fitters should be put on to the work, and they paid them a higher rate of wages than the ordinary gasfitters. The object of this was to save a second visit; the man being capable of doing everything necessary. Reference had been made to the "Sunhot" storage heater. They had tried to push this in Leeds, but unfortunately had had no success. On the other hand, they had had much success with the "Califont." The efficiency of the "Sunhot" was high, but from the point of view of quick service it was not, in his opinion, equal to the "Califont."

ADVANTAGE OF SHORT-PERIOD ACCOUNTS.

Alderman J. H. WADDINGTON (Halifax) said that what people wanted was light, heat, and power. From his point of view, it was the duty of all present to proclaim, in season and out of season, the gospel of the efficiency of the gas industry. What they had to offer was a gas service; and it must be the best that could be provided. In connection with this service, economic factors had to be considered. It was their duty to supply an efficient commodity which could be paid for with the greatest facility. At present the country was passing through a period of depression; and he suggested that the large quarterly bill was working against them. The customers who made the fewest complaints were the penny-in-the-slot consumers, who could get a supply quickly and readily, and could pay for it in the same way. Big gas bills, on the other hand, were a great trouble. In Halifax now they were sending out a certain number of accounts each day, instead of the whole lot at the end of the quarter. In this way, they had money coming in every day. It was his intention very shortly to suggest to the Corporation that they should make their accounts embrace a period of six weeks, instead of a quarter. Under present-day conditions, people's incomes were allocated to such a degree to the providing of instalments on houses or things purchased on deferred payment, that it would be easier for them to pay small bills; and gas undertakings should help them in this direction. The finding of the big money needed for a quarterly account was a real hardship to great numbers of the people.

WHAT METER INSPECTORS CAN DO.

Mr. A. L. JENNINGS (Cleckheaton) drew attention to the fact that the meter inspectors were a great advertising factor. If they were not on good terms with the customers, they ought to be. They should be selected with this point in mind. If the industry made greater use of the meter inspectors as a means of bringing in business, it would be better for the inspectors, for the gas undertakings, and for the consumers. He found that, as a result of giving a very small encouragement to the meter inspectors, they not only reported defects, but brought in on an average an order for an appliance per week; and this was worth considering. He suggested the gas poker as a useful household article representing a consumption which was worth having by a gas undertaking.

LOOKING AFTER THE PRESSURE.

Mr. J. BRIDGE (Elland) said that he had had a maintenance scheme in operation for a number of years; and prior to its coming into force, a number of youths were suitably trained in the maintenance, regulating, &c., of gas-consuming appliances. Great care had been exercised in selecting these youths; and the work they were doing showed how desirable it was to choose the right type of youth. One thing to which they gave special attention was the pressure in consumers' houses. They had a regular system in operation for recording pressures throughout their area of supply, so that they were conversant with the pressures at all times of the day and night, and on all days of the week, not only on the mains, but in consumers' houses. These statistics, collected year after year, had revealed many weak points. They had been able to enlarge where necessary the capacity of the mains, and had got into a position where they could give a more or less constant pressure throughout the 24 hours in the houses of their consumers.

SERVICE TO INDUSTRY.

Mr. MASON said he was rather surprised that the industrial side had not been more emphasized. In Sheffield, for instance, practically 50 p.ct. of the gas consumed was devoted to industrial uses; and, as the Association put forth in their announcements—and it was a perfectly plain statement of fact—something like 3000 trades, many of which were represented in that area, were now being served by the gas industry, with an average of about seven processes in each trade. This showed the overwhelming importance of the service which gas was rendering to industry. Another point which called for emphasis was the necessity, in connection with service, of providing up-to-date showrooms. A gas undertaking was judged by its showrooms even more than by the service given on the district. Dirty, unattractive third-rate premises not only represented the attitude of mind of the people who were behind the undertaking, but they also indicated that in that particular district competitors were going to find it comparatively easy to secure business.

Mr. SINGLETON, answering some of the points raised in the discussion, said that for about fifteen years past they had had identification cards in Huddersfield, and every employee in the distribution department, no matter what branch, carried one; but they had had

to go farther than this, and provide a uniform for all inspectors, to prevent imposters calling upon householders. They also supplied maintenance men with a cap and badge. The average consumption per customer was 26,000 c.ft. per annum, and this reduced the cost per 1000 c.ft. for the amount of work they were doing. The establishment of hot water supply on the storage system would be a very good thing for the gas industry; but in the North of England it was necessary to have a fire practically all the year round, and many householders thought they got their hot water for nothing if they had a fire-back boiler. Until they could make them understand that a certain amount of the heat was going from the coal into the water, there would be trouble in getting the hot water supply load. Only the most competent youths were put on to maintenance work, and they were far more enthusiastic than the seasoned fitters.

SUBSEQUENT PROCEEDINGS.

On rising, those present were the guests of the Chairman and members of the Huddersfield Corporation Gas Committee at luncheon in the Mayor's Reception Room at the Town Hall. Alderman Mitchell presided, and proposed the toast of "The Gas Industry." He said that he had been a member of the Huddersfield Gas Committee for twenty years, and Chairman for seventeen years. During this time vast improvements had been made at the gas-works. The discussion which had taken place that morning on service showed that those connected with the gas industry were alive to the important considerations by which they were faced. If they strove to give perfect service, the future of the industry would be all that could be desired. Mr. Shapley, who replied, mentioned that one of the biggest gas consumers in Leeds manufactured gramophone needles. Alderman Walker (Bradford) proposed "The County Borough of Huddersfield," which was responded to by Councillor S. Kaye (Deputy-Chairman of the Huddersfield Gas Committee), who stated that all the Corporation undertakings were on a profit-earning basis. Much of the success of the gas undertaking was due to the Chairman of the Committee.

AIR POLLUTION AND PUBLIC HEALTH.

Alderman Mitchell again presided at the afternoon session, when the question considered was "Air Pollution and Public Health." Opening the proceedings, the Chairman said this subject was particularly applicable to the West Riding, which was a busy industrial centre, with large towns where much fuel was consumed and smoke turned into the atmosphere. No industry was better able than the gas industry to assist in bringing about an improvement of the existing state of affairs.

Dr. S. G. Moore (Medical Officer of Health of Huddersfield) delivered an address, in which he expressed the opinion that, in order to make greater progress with the removal of the smoke evil, it would be necessary to get closer to the people, who must be made to feel the necessity for a purer atmosphere. A large proportion of the people who lived in towns had done so all their lives, and they regarded the condition of affairs as normal and inevitable. This was a mental attitude that must be changed before they could be induced to take any steps. The appeal must be made individual and immediate. Gas did undoubtedly answer the main requirements. It was economical, convenient, smokeless, and clean; and it was an efficient heating agent.

Dr. J. Jervis (Medical Officer of Health for Leeds), who opened the discussion, said that in permitting the pollution of the air, from which was taken the oxygen that enabled the tissues to carry out their functions, they were doing a great disservice to their own generation and inflicting a handicap on future generations. If the child was deprived of fresh air and sunshine, there was taken from him the material which was going to enable him to build up a perfect body, and, in the course of time, an efficient mentality. One could not justify the pollution of the atmosphere or the squandering of the rich preserves of coal, which were not illimitable. The respiratory diseases which were due to the pollution of the atmosphere were not only the cause of many deaths, but had a damaging and crippling effect on mind and body. He congratulated the British Commercial Gas Association and everyone else connected with the gas industry upon their important contribution to the abolition of smoke.

A number of delegates joined in the discussion. One speaker said that for many years he had burned nothing but gas in his house, and it had not cost him any more than coal. In fact, he was on the right side, when everything was taken into consideration. Another drew attention to the importance of hotel and boarding house gas fires in educating people to their advantages. Suggestions were that in the industry's advertisements they should sell smoke abatement, and that the Fairy Gas Competition should be made the most of in the various districts. The need was pointed out for some tariff which would enable the average consumer to burn gas continually in a fire.

Mr. Mason remarked that even after all that had been done, there still remained a colossal amount of ignorance as to what was being accomplished by the gas industry. What would any industrial centre be like if the gas industry shut-down to-day? He proposed a hearty vote of thanks to the speakers.

Dr. Moore, in reply, said that the gas industry was serving well the best interests of the community. Doctors advocated gas because they knew it was a good and sound proposition.

Acknowledgment was also made of the services of the Chairman and of Mr. Singleton, in connection with the meeting.

In the evening, Dr. C. W. Saleeby lectured on "Sunlight and Health."

GAS SWITCHES.

By J. H. G. Horstmann, of the Horstmann Gear Company, Ltd., Bath.

[Paper before the Western Junior Gas Association, Dec. 7.]

Careful consideration has led me to the conclusion that lighting is the keystone of the gas industry. As an output factor it may be relatively unimportant, especially in industrial areas where gas is used for power and other manufacturing processes; also, even from the standpoint of the purely domestic load, it may not account for more than 15 to 20 p.ct. of the meter readings. The serious point, however, is that, once a consumer's lighting load has been lost, competition has secured a foothold, and is therefore dangerous. A domestic consumer having decided to cross the rubicon is presented by his electricity undertaking (often a branch of the civic authority) with brand new lighting equipment, which will generally compare favourably in performance with the gas lighting hitherto employed, because the latter has usually been allowed to deteriorate in performance in anticipation of the change-over. Anyway, even if the new light is a little disappointing as regards colour and power, there is the delight of operating the new switches, and also the feeling that money is being saved by turning off the light when it is not required.

Electrical salesmen well know that, the first favourable impression having been created, the next step is a fairly easy one, and consists in persuading the consumer to instal electrical fires for the bedrooms. As these fires are used to a comparatively small extent, the effect on the quarterly bill is usually not alarming, so that the conversion to complete electrical equipment is often retarded only by the ability of the consumer to pay for such equipment.

Convenience of Switching.

I would emphasize that the consumer is usually induced to have electric light because of the convenience of switching. It is often difficult to persuade a consumer merely to have modern burners and new fittings in his house. His answer is to the effect that he is thinking of having electricity. Analyze his attitude, and you will find that, when thinking of electric lighting, he is considering the convenience of control. It is therefore evident that distance switches are essential to the gas industry in effectively tackling the problem of electrical competition.

Ignition of the Gas.

The next point is that of reliability. I can state unhesitatingly that, as regards mechanical reliability, the new switches now being produced by my firm are perfect. In qualifying my remarks regarding reliability, by introducing the word "mechanical," the question of the means of ignition of the gas is the point to be considered. Experiments over a number of years have proved that in the present state of knowledge a by-pass jet is the most reliable means of ignition. I think that electric ignition by means of batteries is impracticable for two reasons. First, batteries are relatively expensive to instal, and cannot, in my estimation, be made and fitted to a gas service at a combined price which will compare favourably with the cost of installing electricity. Secondly, unless a somewhat complex time-lag mechanism is employed electric ignition is uncertain.

As regards the use of catalytic agents there are rumours of new inventions approaching commercial success. When available they will undoubtedly enjoy a very wide sale. Known catalytic agents are, however, not satisfactory. I have personally experimented with dozens of them, in various ways, but have been unable to achieve uniform results. As regards ignition by sparks frictionally produced, the matter is more promising; but at present we cannot see a commercial proposition in our efforts, as applied to domestic use.

By-Pass Consumption.

On the other hand, great improvements have been made in by-passes during the last few years. These improvements are detail ones, but by-passes can now be obtained which are unquestionably reliable even when exposed to severe draughts—

and they are economical. The consumption of the type recommended by my firm is approximately ¼ c.ft. per hour at 30/10ths pressure. With gas at 3s. per 1000 c.ft., this results in a cost of approximately 4s. 6d. per point per annum.

Unless more than three by-passes are used in a household, it is doubtful if the average meter will fully register such a small consumption. From the point of view of competition it is open to discussion whether it is desirable that consumers should be called upon to pay for by-pass consumption—especially if they are advised to that effect.

THE "NEWBRIDGE" SWITCH.

Having dealt with what I believe to be the only argument against gas switching in our present stage of development, I propose to give a few particulars of the apparatus manufactured by my firm.

The gas cock employed is the result of accumulated experience in the manufacture of valves operated by clockwork for street lighting, &c. Now the problem in designing valves for clockwork controllers is to produce a type which may be operated with a minimum of energy and which will withstand the heat given off by modern superheated cluster burners. For domestic use, the control valve must also be capable of long periods of use without attention, and must be definitely gas-tight under the above conditions.

We have solved this problem satisfactorily by chromium plating the plugs by what is known as the cold process. Cold deposited chromium plating possesses several additional advantages over the hot process which is applied so extensively in motor car and bicycle practice at the present time. First, it is a much thicker deposit, and, secondly, it is a great deal harder—anything between 80 and 90 p.ct. diamond hardness. The surface, after polishing, possesses what may best be described as a "greasy" nature, having a very low coefficient of friction. It will not seize in contact with brass, even without lubricant. I think it may be safely assumed that chrome plated plugs will not be improved upon in performance. The only drawback is the rather high cost of production—especially in the finishing process.

The next point to consider is the hand control. We made a large number of experimental alternative types before producing the design we decided to place on the market. Our reasons for this design are the small space occupied, our own notions as regards artistic appearance, and the cost of production. We have not forgotten the need for sunk or flush switches; and these will shortly be available. Improvements will be introduced from time to time, as and when we receive suitable suggestions from clients, or our designers conceive new ideas.

TRANSMITTING MEANS.

After careful experiments, we have adopted a system of transmission between the hand control and the gas cock which, we submit, is practically ideal, being absolutely positive and permanent, and also possessing a very high margin of mechanical strength. A single strand of 21 gauge nickel silver wire having a tensile strength of approximately 100 lbs. is free to slide to and fro in a casing of hardened and tempered continuous spring wire, closely coiled. The spring casing is protected by a lead tube having an outside diameter of $\frac{1}{16}$ in. It is similar in appearance to ordinary lead covered electric cable, but, being of smaller diameter, it is neater.

The inner wire is tensioned to turn the gas cock on, and pushed to turn the gas cock off. No spring return arrangement is used; the spring casing acts as an efficient guide to the inner wire, sufficient clearance being allowed to eliminate binding. The tolerance is, however, such that backlash due to reversal of direction of movement of the wire on bends is reduced to a minimum. With a properly fitted set with 24 ft. of cable and about three bends of recommended radius, no noticeable backlash, or idle movement, is present at the hand control, but, with lengths of about 50 ft. and over, with a large number of bends, a certain amount of backlash is inevitable. In my own house I have a set with 42 ft. of cable employing three hand switches controlling one pendant light, and the total number of bends is twelve. With this set a little backlash can be felt, but it does not interfere in the slightest degree with the functioning of the switch.

The outer casing for the control wire is an important feature of our design, and has the following advantages:

(1) It eliminates wriggling of the cable.
(2) It permits easy setting of the cable to the required radius, and—to use an expressive American phrase—it enables the cable to "stay put" during the operation of fixing.
(3) It provides perfect protection against atmospheric conditions, for the spiral wire and the inner wire.
(4) It is equally satisfactory for cleating to walls or embedding in plaster.
(5) Its appearance is slightly more satisfactory than electric cable, owing to the smaller size.

Before the cables are loaded with wire, the latter is passed through a special apparatus for removing initial kinks and to apply a coating of lubricant. It is found, in practice, that the more the switch is used the freer its action becomes. An examination of the inner wire after a period of use reveals that its movement in the spring casing causes its surface to become polished on bends. This polishing, though definite, does not produce measurable wear on the wire, but the reduction in friction is manifest.

"Duplex" control switches are now available enabling a light to be switched on or off from two or three different points. This is done by means of a special junction box, with which arrangement one, two, or three different lighting points may be controlled by one, two, or three hand switches.

We have often been asked what is the greatest distance that may be employed between the tap and the hand control. At present the longest cable we are listing is 48 ft., but we have employed experimental sets using up to 105 ft. which work perfectly satisfactorily. We shall not market switches with very long cable for the present, as great care and expense are involved in loading the outer cable with inner wire, and, further, considerable care has to be exercised in fitting such long sets.

To sum up, I think it will be agreed that reliable switches will enable gas engineers to compete on much better terms with electricity for lighting. Absolute reliability is, however, essential. "Hit or miss" methods are the worst possible advertisement. The use of switches enables artistic lighting effects to be introduced which would be impossible with the normal means of control. The feminine mind is strongly repelled by ugly, cumbersome fittings in the house, and indirect bowl lighting or shaded central fittings necessitate the use of switches.

AROUSING THE INTEREST OF CONSUMERS.

The next step is publicity. The interest of consumers must be aroused to the fact that gas lighting is cheaper than, may be equally artistic as, and is equally safe and equally convenient as, electricity. Everyone must admire the boldness of the mass attack made by the Electrical Development Association upon the domestic lighting load. Almost every newspaper has some advertisement extolling the virtues of electricity. In the North and Midlands, free wiring schemes are being offered—and largely accepted. We are bound to keep the selling cost of the switches at a reasonable figure, and national advertising is very expensive. If gas undertakings will co-operate with us, and take a serious interest in the retention of their lighting load, good results are bound to follow.

As far as individual advertising is concerned, doing this sufficiently boldly and continuously to give good results would reflect in increased prices of the switches, which we are anxious to avoid.

The best suggestions I have to offer are canvassing by maintenance men, offering switches on rental or hire-purchase charges, local Press advertising by gas undertakings, and attractive window displays, also issuing our leaflets regarding switches with gas accounts.

Enthusiasm and initiative are essential if gas lighting is to be maintained; and I think the lighting load is, indirectly, the most important factor in the business of a gas undertaking.

Discussion.

Mr. J. T. SPENCER (President of the Association) stated that much of the efficiency of this apparatus depended upon the by-pass, especially where it was placed in an exposed position.

Mr. A. W. CULLINGTON (Stroud) said that trouble had been experienced in attaching the cable of the switch to some of the present-day ceilings and walls. Had anything been done to obviate the unsightly appearance of the cable from the ceiling to the burner of a pendant light?

Mr. B. F. HARRIS (Trowbridge), in proposing the vote of thanks, asked what was the best method of fixing the cable to an asbestos ceiling.

Mr. W. BARBER (Cheltenham) seconded the vote.

Mr. HORSTMANN, in reply, said that experiments were being carried out upon the best type of by-pass, and excellent results were now being obtained from one with a very restricted jet. It had been found that "Rawlplugs" were admirable for attaching the cable to walls or ceilings, though, naturally, the best method would be to lay the cable under the floor boards. It should only be fixed outside as a last resource. Collaboration with manufacturers was now being carried out in attempting to devise inclusive fittings, thus obviating unsightly apparatus.

"Clean Air."

The National Smoke Abatement Society have published the first issue of a journal, entitled "Clean Air," the aim of which is to give publicity to the work of the Society and to smoke abatement topics generally. "Clean Air" will be issued quarterly at a price of 1s. (or 2s. 6d. a year post free), and it will not be run for commercial profit, though it is to be hoped that it will assist the funds of the Society. It is intended to have, in each issue, two informative articles of value to the work of smoke abatement, written by recognized authorities, in addition to general articles, news, and reports. The first number contains an account of the inauguration of the Society at Buxton last October, and extracts from the paper by Mr. Samuel Tagg, Engineer and Manager of the Preston Gas Company, at the Buxton Conference—see "JOURNAL," Vol. 188, p. 90.

SCOTTISH JUNIOR GAS ASSOCIATION (EASTERN DISTRICT).

Visit to the Lady Victoria Pit and Gas-Works.

On Saturday afternoon, Dec. 7, over fifty members of the Association visited the Lady Victoria Pit and Gas-Works owned by the Lothian Coal Company, Newtongrange, Midlothian. Mr. Mackay (General Manager), Mr. Murray (Secretary), Mr. Haldane (Under Manager), Mr. Humphrey (Chief Engineer), and Mr. Bishop (Gas Manager) extended a hearty welcome to the visitors.

The Lady Victoria Pit.

The coal seams worked are embraced in the formation described in the geological survey as the carboniferous limestone, and include: (1) The Jewel Seam, which yields a high-class household coal, and also the famous Newbattle Cannel used in all the principal gas-works at home and abroad for gas enrichment purposes. This seam is found here of excellent quality, and in the most favourable conditions for working. (2) The Splint Seam, which is a high-class steam coal, in large demand for shipment abroad, and also for home consumption. (3) The Coronation Seam, which is a good household coal. (4) The Diamond Coal, a household coal of the highest class. (5) The Great Seam, which is similar to the Splint Seam in quality.

Washing Plant.

The dross from the various screens is carried by a scraper conveyor to a dross "pit" sunk about 21 ft. below the surface level and placed alongside the washer. The dross is elevated out of the pit to a height of about 60 ft., and deposited on a distributing plate, from which it passes to a series of inclined jigging-screens. The principle of this type of washer is to separate the coal into the various sizes required, and then to wash each size separately. The coal is divided into five sizes before washing—viz., treble, double, and single nuts, peas, and duff. The quantity of water required to wash the coal is about 1000 gallons per minute. An endless chain, carrying perforated steel buckets and moving at a slow speed, removes the deposit of fine coal from the silt recovery tank. This fine coal is used for firing the boilers at the Colliery.

With the exception of the pithead and screens, the whole surface works are lighted by incandescent gas lamps. The gas is made at the Company's own works at Newtongrange, from which it is also supplied to the Colliery villages and neighbourhood.

Newtongrange Gas-Works.

The retort house is 56 ft. long by 32 ft. wide. There are four settings of three retorts 20 in. by 14 in. by 9 ft. 6 in. long, heated by generator furnaces. Coal is brought into the works by railway, which runs parallel to the south gable of retort house, and is emptied from wagons by hand into store. The charging bogie runs on a narrow-gauge railway parallel to the bench. All the coal is passed over weighing machine, so that the results per ton carbonized can be checked daily. The annual make of gas is 13½ million c.ft. The condenser is of the ordinary atmospheric type, and the exhauster is of the Waller three-blade pattern. The washer is of the Young automatic type, and the purifiers are water-luted type. Benzole recovery is carried out continuously by washing with creosote. The crude benzole is rectified, and sold as motor spirit.

After the workings and the gas-works had been inspected, the visitors were entertained at tea.

Mr. J. Scobie, President of the Association, expressed thanks to the Directors and Management for the privilege granted to inspect their efficient Colliery. From what he had seen that afternoon he had come to the conclusion that the Company were the pioneers of progress as far as mining in Scotland was concerned. He asked Mr. Murray, Secretary to the Company, to convey to the Directors their appreciation for the hospitality extended, and to the staff for showing them the workings.

Mr. Murray, in reply, said they had a very old connection with the gas industry in Scotland, and their direct sales to gas-works were extensive.

GAS STOCK AND SHARE MARKET.

[For Stock and Share List, see later page.]

There was no change in the general conditions on the Stock Exchange last week. Both dealers and the public continued in a state of nervous uncertainty, and the business that was done gave no indication of any immediate revival. British Government stocks were perhaps the strongest feature. Even these seemed to derive their attraction from the gold prospects rather than from the unexpected Bank Rate decision; and the only conclusion that can be come to is that the reduction checked any further depreciation.

It will be seen by the list of Gas Stocks appearing elsewhere that, with one exception, the week was a blank one so far as variations in ordinary stock quotations were concerned. The exception was Liverpool 5 p.ct., which was marked down 1 point to 91-92 at the Liverpool Exchange. Having regard to the regularity of dividends on this stock and to the local interest, the quotation is a low one; and if there is any stock available, the opportunity should not be missed of securing a safe and reliable investment. Several bargains were recorded in the dealings—such as Croydon sliding-scale at 105½ (last dividend 7 p.ct.), Commercial ordinary 90 (last dividend 6 p.ct.), and Alliance and Dublin 94 (last dividend 7⅞ p.ct.).

The following transactions were recorded during the week:

Monday.—Aldershot 4 p.ct. pref. 72, Bournemouth "B" 12⅝, British 114, Cardiff 99, Commercial 90, Croydon sliding-scale 105½, 106, max. div. 83, 83½, European 13, 13½, Gas Light and Coke 17s. 9d., 17s. 10½d., 18s., 18s. 1½d., 3½ p.ct. max. 60¾, 4 p.ct. pref. 74, 5 p.ct. deb. 100, Imperial Continental 342, 345, 346½, 347, 348, Montevideo 105, Primitiva 28s. 11¼d., South Metropolitan 100, 100¾, South Suburban 5 p.ct. deb. 94, Tuscan 35s. Supplementary prices, Bournemouth 7 p.ct. deb. 100½, Cheltenham 4·p.ct. deb. 62, 62½, Croydon 5 p.ct. deb. 93.

Tuesday.—Bristol 5 p.ct. 85, Commercial 3 p.ct. deb. 56½, 56⅝, European 12⅞, 13, Gas Light and Coke 17s. 11½d., 18s., 18s. 1½d., 4 p.ct. pref. 74, 5 p.ct. deb. 99¼, Hastings and St. Leonards 5 p.ct. 99, Imperial Continental 340, 342, 346, San Paulo 6 p.ct. pref. 8⅞, 9, South Metropolitan 100, 6 p.ct. pref. 106¾, Tottenham 4 p.ct. deb. 72½, Tuscan 39s. Supplementary prices, Barnet 5 p.ct. deb. 95½, Bath 90, Bournemouth 7 p.ct. deb. 100½, Eastbourne "B" 100, Reading 5 p.ct. 82½, 83, Tottenham 5 p.ct. pref. 85.

Wednesday.—Alliance and Dublin 94, Barnet 7 p.ct. max. 114, 115, Brighton 6 p.ct. 114, European 12⅞, 13, 13¼, 13⅜, Gas Light and Coke 17s. 10½d., 18s., 18s. 1½d., 4 p.ct. pref. 74, 76, 3 p.ct. deb. 57⅞, 5 p.ct. deb. 99, 100, Imperial Continental 340, 3½ p.ct. deb. 72, Primitiva 29s. 1½d., 4 p.ct. cons. deb. 80⅝, 81⅛, South Metropolitan 100, Tuscan 42s. 6d. Supplementary prices, Croydon 5 p.ct. deb. 92½, East Surrey 5½ p.ct. pref. "A" 90, Liverpool 5 p.ct. 92½, 93.

Thursday.—Aldershot 4 p.ct. pref. 71, British 114, Commercial 90½, 3 p.ct. deb. 56⅛, European 13, 13⅛, Gas Light and Coke 17s. 10½d., 18s., 18s. 3d., 3½ p.ct. 60½, 4 p.ct. pref. 74¼, Imperial Continental 338½, 343, 344, Montevideo 105, Portsmouth 4 p.ct. 115, Primitiva 4 p.ct. cons. deb. 80¾, 81¼, South Metropolitan 99¾, 100, 100¼, 100⅜, 101, South Suburban 5 p.ct. 103, Tottenham 3½ p.ct. 105½, Tuscan 37s. 6d.

Friday.—British 5 p.ct. deb. 96½, Gas Light and Coke 17s. 10½d., 18s., 18s. 1½d., 4 p.ct. pref. 74¼, 5 p.ct. deb. 98½, Imperial Continental 335, 336, 340, 342, 343, Montevideo 106, South Metropolitan 6 p.ct. pref. 107½, Wandsworth, Wimbledon 5 p.ct. 106. Supplementary prices, Aldershot "A" 81⅜, Croydon 7½ p.ct. pref. 102½, 103½, Sunderland 96¾.

In Lombard Street loan conditions were unusually tight at the week-end; but while 4½ p.ct. was mostly charged for both renewals and new money, the rate eased off towards the close, until balances were obtainable at as low as 4 p.ct. Despite the reduction in the Bank Rate, Treasury Bills averaged but slightly below (2·07d. p.ct.) the previous week's rate at £4 15s. 9·67d. p.ct., and Discount rates were firm in tendency.

Foreign Exchange movements were mostly unfavourable to Sterling. The Paris rate declined further to 123.93; Belgas to 34,86¼; Italian lire to 93.20; and German marks to 20.37⅞. The New York rate was unaltered at 4.88 1/32; Spanish pesetas depreciated to 35.25½; and Dutch florins were unchanged at 12.09⅜.

Silver was a quiet market, but the price recovered to 22 5/16d. per oz. The price of Gold in the open market remained at 84s. 11½d. per oz.

The Bank Rate is 5 p.ct., to which it was reduced from 5½ p.ct. on Dec. 12. The Banks' deposit rate is 3 p.ct., and the deposit rates of the Discount Houses are 3 p.ct. at call and 3¼ p.ct. at notice.

RECOVERY OF BENZOLE FROM COAL GAS, WITH PARTICULAR REFERENCE TO THE USE OF ACTIVE CHARCOAL.

By H. HOLLINGS, M.Sc., A.I.C., S. PEXTON, Ph.D., and R CHAPLIN, Ph.D., A.I.C.

[From a Paper read at a Conference of the Institution of Chemical Engineers held at Burlington House, London, W. 1, on Thursday, Dec. 5—Mr. F. Heron Rogers (Vice-President) in the Chair.]

(*Concluded from p.* 718)

PART III.

THE CONSTITUENT PRIMARILY RESPONSIBLE FOR THE DEPRECIATION OF ACTIVE CHARCOAL.

The foregoing work shows that all the active charcoals examined, whatever their origin, exhibit a marked tendency to depreciate on continued use with coal gas, and that this is due to the action of some constituent or constituents of the benzole which gives rise to the formation within the charcoal of a gum of low volatility.

An idea of the extent to which this gum formation proceeds may be gained from a consideration of the increases in weight of the charcoal at the conclusion of several of the experiments. Thus, in one experiment, the charcoal increased in weight by 37·4 p.ct. after 66 cycles, while its absorptive capacity for benzole fell from 29·2 p.ct. to 5·7 p.ct. in this period. The capacity of the charcoal for fouling substances is thus greater than its initial capacity for benzole. This kind of effect is clearly not analogous to the poisoning of a catalyst, in which the presence of a minute amount of a foreign substance may cause an inordinate fall in activity. Nevertheless, when viewed in relation to the total gas volume or total benzole yield associated with it, the quantity of gum which accumulates in the charcoal is small. In a typical example, the weight increase was found to represent 2·6 p.ct. of the total recovered benzole, and 0·0165 gr. per c.ft. in the gas. Substances present in coal gas in such a quantity would be regarded as trace constituents; and it seemed desirable at this stage to examine some of these as possible factors in the depreciation of active charcoal. Some guidance was forthcoming from the fact that the prefiltration of the gas through a separate charcoal filter to remove naphthalene did not at any stage in any experiment prevent the depreciation of the charcoal from which the benzole was recovered. This suggested the operation of some substance with respect to which charcoal has a low "breakpoint" value. From certain unpublished work it was known that hydrocyanic acid appears in this category, and, further, that, though the absorptive capacity of charcoal for this substance is low, a small proportion of the sorbate is held with tenacity. The latter fact especially placed hydrocyanic acid in a suspicious light, for hydrocyanic acid is reactive in organic chemistry, and the conditions for reactivity are satisfied in the present case. Apart from this, hydrocyanic acid is prone to polymerize in the free state to a brown solid, and there was no reason to suppose this would not happen in the charcoal. The characteristic odour of the condensed steam from charcoal showed that hydrocyanic acid was being taken up from the coal gas. These facts considered together appeared sufficient to warrant a study of the effect of hydrocyanic acid in depreciation, and the investigation was continued from this point of view.

EXPERIMENTAL.

Hydrocyanic Acid Measurements.—Charcoal activated with phosphoric acid was employed for all experiments referred to in the following work. Hydrocyanic acid was found to be present in all the condensates recovered during the distillation of benzole. The quantity present was ascertained, comparison among the various charcoals being facilitated by referring the hydrocyanic acid to unit weight of charcoal. Volhard's method was employed for this purpose. Three experiments on the relation between heat treatment and depreciation had been started previously, and had now reached the stage of seventy saturations. In one experiment, A, the procedure consisted in heating the saturated charcoal at 135° C. for two hours prior to passing steam. This charcoal showed a rapid rate of depreciation. In a second experiment, B, the charcoal was raised to 140° C. as quickly as possible prior to passing steam. The charcoal showed a low rate of depreciation. In the third experiment, C, the charcoal was heated to *circa* 100° C. for 1 hour prior to passing steam, and this charcoal showed a rate of depreciation intermediate between the other two.

The hydrocyanic acid present in the aqueous condensate from these charcoals was determined and referred to unit weight of charcoal in each case. The results of determinations for the 70th saturation are given below together with the absorptive capacities of the charcoals for benzole.

HCN in Aqueous Condensates.

Charcoal.	Absorptive Capacity.	HCN Evolved.
A—70 saturations . .	41·5 p.ct. initial	0·098 mgrs. per gr.
B—70 ,, . .	81·1 ,, ,,	0·442 ,, ,,
C—70 ,, . .	66·4 ,, ,,	0·274 ,, ,,

The actual quantities of hydrocyanic acid shown are small, but are probably accurate to the third place of decimals. Relatively they are quite different, and suggest that hydrocyanic acid is retained by the charcoal and involved in the depreciation process.

The results, however, are not conclusive, because no account has been taken of other avenues of escape of hydrocyanic acid or of the quantities previously absorbed by the charcoals. Measurements of the total hydrocyanic acid absorbed by and evolved from the charcoals were now undertaken, so that the quantity retained could be ascertained with certainty. The quantity absorbed was calculated from determinations of the total hydrocyanic acid in the inlet and outlet gases; and the quantity evolved, from determinations of hydrocyanic acid in the benzole, in the absorbed gases as well as in the aqueous condensate. The hydrocyanic acid in the gases was determined by the zinci-cyanide method. That in the liquids was determined by Volhard's method.

The complete measurements were confined to the charcoals A and B previously described and representing the two extremes of depreciation. The following results refer to the 71st saturation:

HCN and Heat Treatment.

Charcoal.	Absorptive Capacity. Initial.	Hydrocyanic Acid Mgrs. per Gr.		
		Absorbed.	Evolved.	Retained.
	P.Ct.			
A—71 saturations	41·1	0·379	0·118	0·261
B—71 ,, ...	80·7	0·882	0·801	0·081

These results show that a much greater proportion of the hydrocyanic acid absorbed is retained by the preheated charcoal than by the other charcoal, which confirms the indications already obtained. Owing to the smallness of the quantities of hydrocyanic acid involved, it was thought desirable to confirm the effect of heat treatment. For this purpose the heat treatment was reversed in the 72nd saturation, the saturated A charcoal being plunged into the oil bath at 130° C. and distilled immediately, while the saturated B charcoal was heated at 140° C. for 2 hours prior to distillation. The following results were obtained which leave no doubt of the validity of the measurements:

HCN and Heat Treatment.

[Reversal of Conditions for 72nd Saturation.]

Charcoal.	Absorptive Capacity. Initial.	Hydrocyanic Acid Mgrs. per Gr.		
		Absorbed.	Evolved.	Retained.
	P.Ct.			
B—72 saturations	80·4	1·202	0·494	0·708
A—72 ,, ...	40·7	0·128	0·119	0·009

Nitrogen Content of Fouled Charcoals.—To obtain confirmation of the effect, the total nitrogen content of the charcoals A and B was determined after 72 saturations, for evidently the continued fixation of hydrocyanic acid would result in an increase in the nitrogen content of the charcoal. The Kjeldahl method was employed, and, to obtain a true comparison of the quantities of nitrogen accumulated in the course of the experiments, the nitrogen present in some of the fresh charcoal was determined and discounted. The fresh charcoal used in the experiments was found to contain 0·42 p.ct. of nitrogen. The

following results were obtained on the used charcoals, and refer to the original weight of the charcoal in each case:

Nitrogen Content of Fouled Charcoals After 72 Saturations.

—	Total.	Accumulated.
	P.Ct.	P.Ct.
B	0·94	0·52
A	1·90	1·48

The charcoal which has been subjected to the most prolonged heat treatment contains more nitrogen than the other, which confirms, at least qualitatively, the conclusion drawn from the direct measurements on hydrocyanic acid. The assumption here is that the whole of the nitrogen found is derived from hydrocyanic acid, which, of course, is not necessarily true. Since the least depreciated charcoal contains the least instead of the most nitrogen, it is probable that this nitrogen is derived from hydrocyanic acid. The accumulated nitrogen is, in fact, related to the loss of absorptive capacity, as the following ratios show:

Charcoal.	Absorptive Capacity. Initial.	Loss.	Nitrogen.
	P.Ct.	P.Ct.	P.Ct.
A—72 saturations	40·7	59·3	1·48
B—72 ,, ...	80·4	19·6	0·52

Ratio.
19·6/0·52 = 37·7
59·3/1·48 = 40·0

Examination of the Gum from Fouled Charcoal.—The gum formed in depreciation can be partially removed from the charcoal by distillation with steam or nitrogen at temperatures of 500°-600° C. A small quantity of gum was obtained in this way from a sample of fouled charcoal taken from the experimental plant. This was submitted to a cursory examination only, with the object of obtaining some qualitative data which would characterize the gum. A few characteristics of the gum are given below:

Colour—Clear, dark brown.
Odour—Characteristic and sickly.
Solubility—Freely soluble in benzene and acetone. Also completely soluble in warm concentrated nitric acid. Soluble with slight residue in hot concentrated hydrochloric acid.
Sulphur—Present.
Nitrogen—Present.

The nitric acid solution on dilution with water gave a bright yellow precipitate. The same properties were observed in the case of some residue from old benzole, and it appears that the depreciation of charcoal and the resinification of benzole, such as takes place in the absence of light, are due to the same reactions. Thus, the benzoles obtained from charcoals under conditions which cause the greatest rate of depreciation give the least residue on storage, as illustrated by the following results.

The benzole B was obtained in the course of the experiment in which the saturated charcoal was rapidly brought to the distillation temperature and at once distilled. The benzole A was obtained in the experiment in which the saturated charcoal was maintained at 135° C. for 2 hours prior to distillation. They were obtained at the same stage of the life of the charcoal and stored under the same conditions.

Benzole.	Age.	Residue.
	Months.	Mgrs. per 100 c.c.
B	6	194·0
B	14	376·5
A	6	10·5
A	14	21·0

Again, the weight of material left in the charcoal under conditions of extreme depreciation is found to approximate very closely to the gum-forming constituents in the benzole recovered under conditions of very slight depreciation. It is only in the case of a benzole recovered under these conditions that practically the whole of these constituents are present in the benzole.

Considering the case of charcoal first, it is found that with experimental plant, in which the rate of depreciation was high, the charcoal increased in weight by 31 p.ct. after yielding benzole equal to 13·5 times its own weight. Ignoring other heavy constituents retained, the weight of material deposited is found to be 2·29 p.ct. of the total benzole recovered.

Another calculation based on the results of the A experiment already referred to shows that the deposited material was 2·65 p.ct. of the total benzole recovered.

Next consider the residue from benzole. A sample of benzole was obtained by means of the experimental filter under conditions entailing a very low rate of depreciation of the charcoal. This was stored eleven months freely exposed to daylight, after which it was found to give more residue than any other benzole examined, though some of these were four years old. The resinification process in this benzole must therefore have been practically complete in this case. The residue left on evaporation was found to be 2·03 p.ct. of the volatile spirit. The corresponding values for charcoal were 2·29 p.ct. in one case and 2·65 p.ct. in another. Better agreement would undoubtedly be shown if the benzole retained by charcoal could be discounted. There is no reason to expect agreement at all except on the theory advanced.

Action of Coal Gas free from Hydrocyanic Acid.—The theory that hydrocyanic acid is the active agent in the depreciation of charcoal was now put to direct test by studying (*a*) the effect of coal gas free from hydrocyanic acid on the charcoal, and (*b*) the stability of the benzole obtained by charcoal from such gas. For this purpose two experiments were arranged. In one experiment the absorptive capacity of the charcoal was measured at intervals during 66 saturations in which coal gas free from hydrocyanic acid was used, and the saturated charcoal was heated for 2 hours at 130° C. prior to each distillation. To obtain early indications of the effect of removing hydrocyanic acid from the gas, the absorptive capacity of the charcoal was determined at intervals by a special method.

In the other experiment the charcoal was contained in the experimental filter, treated with coal gas free from hydrocyanic acid, and the benzole recovered was experimented with. The hydrocyanic acid was removed from coal gas by passing the gas through decinormal silver nitrate solution containing silver hydroxide in suspension, which neutralized the nitric acid formed. It was found by testing the effluent gas that the hydrocyanic acid could be completely removed in this manner.

The effect of removing hydrocyanic acid on the rate of depreciation will first be considered. To obtain a true comparison, the U-tube experiment with the specially purified gas was checked by running a control experiment with ordinary coal gas under exactly the same conditions. In Table XII. the results obtained with coal gas free from hydrocyanic acid are designated F, and those obtained with normal coal gas G. The average hydrocyanic acid content of the coal gas during the course of the experiment was 8·7 mgrs. per c.ft.

TABLE XII.—*Removal of Hydrocyanic Acid and the Effect on Depreciation.*

No. of Saturations.	Absorptive Capacity. Grs. per 100 Grs. of Charcoal.	
	F.	G.
0	36·5	36·6
10	30·4	26·2
20	31·1 (?)	23·9
30	29·3	22·5
51	28·9	18·4
66	28·1	15·9

The results are plotted in fig. 13.

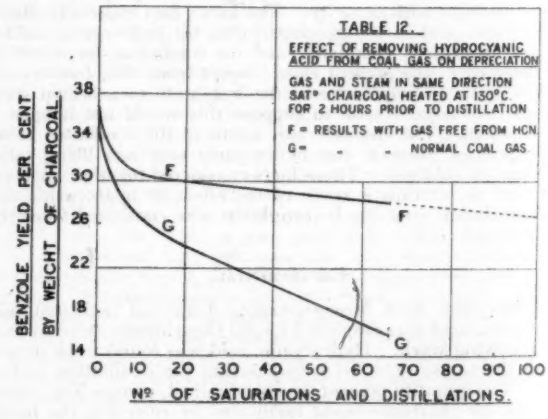


TABLE 12.
EFFECT OF REMOVING HYDROCYANIC ACID FROM COAL GAS ON DEPRECIATION
GAS AND STEAM IN SAME DIRECTION
SAT° CHARCOAL HEATED AT 130°C. FOR 2 HOURS PRIOR TO DISTILLATION
F = RESULTS WITH GAS FREE FROM HCN.
G = " " NORMAL COAL GAS.
BENZOLE YIELD PER CENT BY WEIGHT OF CHARCOAL.
38
34
30
26
22
18
14
F
G
F
G
0 10 20 30 40 50 60 70 80 90 100
Nº OF SATURATIONS AND DISTILLATIONS.

Fig. 13.

The first measurements of absorptive capacity were carried out after ten saturations. The difference in the results as early as this was quite definite, but the experiment was extended because it was realized that the major loss of capacity in both cases at this early stage was due to the accumulation of the heavier constituents of benzole. A better comparison is obtained by considering results at a later stage. Thus, after 66 saturations the F charcoal yielded 12·2 p.ct. more benzole than the other; or, again, the F charcoal only fell to 26·2 p.ct. yield after some 110 saturations (by extrapolation), while the G charcoal reached this yield value after 10 saturations. The removal of hydrocyanic acid from the gas thus results in a great lengthening of the life of the charcoal.

At the conclusion of the experiment the G charcoal, when heated at 500°-600° C., yielded gum and choking white fumes.

The F charcoal was similarly distilled, but yielded no gum or fumes.

The F charcoal still shows a definite low rate of depreciation, the cause of which has not been definitely established. The effect would appear to be due to the gradual accumulation of heavy substances present at low concentration in the gas. Such substances, if strongly absorbed by charcoal, would require the passage of very large volumes of gas for the transport of a sufficient quantity to represent equilibrium.

EXPERIMENTS ON THE BENZOLE FROM COAL GAS CONTAINING NO HYDROCYANIC ACID.

The following experiments were undertaken to obtain confirmation of the hydrocyanic theory of the depreciation of charcoal. No attempt was made in this work to investigate the general problem of resinification of benzole.

The general conclusions from the preceding work are: (1) The depreciation of charcoal and the resinification of benzole are manifestations of the same reaction. (2) The depreciation of charcoal is caused by hydrocyanic acid in the gas. It follows from this that benzole obtained from gas containing no hydrocyanic acid should not resinify in the absence of light.

This stringent test of the theory was applied by determining the stability of the benzole extracted from the specially purified gas in the manner previously described. The residue from this benzole was determined (*a*) after the benzole had been refluxed at the boiling-point for 20 hours, and (*b*) after the benzole had been stored under normal conditions for a period of time. Corresponding data for benzole from untreated coal gas were obtained for comparison.

The object of refluxing the benzoles was to increase the amount of residue left on evaporation, and so emphasize any difference. Some typical examples of the effect of refluxing fresh benzoles from ordinary coal gas are given below. The benzoles were dried over calcium chloride and gently boiled on a steam bath for 20 hours under an efficient reflux condenser open to air. Losses rarely exceeded 2½ p.ct., and were allowed for in the calculation of residue.

Action of Heat on Fresh Benzoles.

Sample.	Residue Mgrs. per 100 C.C.	
	Before Reflux.	After Reflux.
1	19·5	60·0
2	1·0	18·0
3	6·0	23·5

The benzole extracted from coal gas free from hydrocyanic acid is designated F, and that extracted from ordinary coal gas G. Samples of these benzoles were refluxed on the same bath and for exactly the same length of time (20½ hours), after which the residues were determined in the following manner: The benzole was evaporated at 100° C. from a glass vessel first for 30 mins. *in vacuo*, and then for 90 mins. in a stream of nitrogen. The results obtained are given below.

Hydrocyanic Acid and Benzole Stability.

(i) Residue after 20½ hours reflux.

Benzole.	Residue Mgrs. per 100 C.C.	
	Before Reflux.	After Reflux.
G	7·0	35·5
F	<1·0	<1·0

The residue from the F benzole is very small, and is not increased by refluxing. It is less than 1-35th of that from the G benzole after refluxing. On the other hand, the G benzole gave five times as much residue after refluxing as previously. This recalls the effect of heat on saturated charcoal.

The benzoles G and F were now moistened with water and stored in clean, tinned-iron cans for 21 weeks at room temperature. These were considered normal storage conditions. Samples were then dried over calcium chloride and submitted to the evaporation test as before. The results are given below.

Hydrocyanic Acid and Benzole Stability.

(ii) Residue after 21 weeks' storage.

Benzole.	Residue Mgrs. per 100 C.C.
G	90·0
F	<2·0

The results again show that the tendency of the benzole F to resinify is practically *nil*.

The negative results of both tests are all the more significant when it is remembered that they were predicted.

Action of Hydrocyanic Acid on Benzole.—The special benzole F should be susceptible to the action of hydrocyanic acid, since previous action in the charcoal had been precluded. The tendency of this benzole to react with hydrocyanic acid was studied (*a*) after contact in the cold, (*b*) after contact under the influence of heat. Hydrocyanic acid may be introduced into benzole by shaking it with dilute potassium cyanide solution weakly acidified with sulphuric acid. There is, however, a danger that the sulphuric acid may exert some action on the benzole. In the experiments described below this danger was precluded by treating benzene with acidified potassium cyanide solution and adding the benzene solution of hydrocyanic acid to the benzole. The method further simplified the problem of the combination of hydrocyanic acid with benzole since a benzene solution of known strength could be mixed with a known volume of benzole, and any remaining free hydrocyanic acid determined.

Volhard's method was used for determining the hydrocyanic acid in benzene or benzole, and the results were found to be reproducible to within 0·1 mgr. of hydrocyanic acid per 100 c.c.

The mean molecular weights were calculated from the vapour densities of the benzoles determined in a Victor Meyer apparatus. These could be reproduced to within 0·1 unit with the apparatus employed.

(*a*) *Action of Hydrocyanic Acid in the Cold.*—The mean molecular weight of a sample of the special benzole F was determined and found to be 84·7. A mixture of 75 p.ct. of benzole F and 25 p.ct. of pure A.R. benzene was made, and the mean molecular weight of the mixture determined. Allowing for dilution, the result was again 84·7. Some of this mixture was refluxed at 87° C. on a water bath for 1 hour, after which it was cooled and the mean molecular weight redetermined. It was found to be still 84·7.

A solution of hydrocyanic acid in benzene was then prepared by the method described, and found to contain 24·57 mgrs. of hydrocyanic acid per 100 c.c. Of this solution, 100 c.c. was quickly introduced into a well stoppered bottle containing 300 c.c. of the benzole F. All materials used had been dried over calcium chloride. The concentration of hydrocyanic acid in the mixture was determined at once and found to be 5·4 mgrs. per 100 c.c.

The mixture of benzole and benzene containing hydrocyanic acid was kept at room temperature for 16 days, and determinations of hydrocyanic acid content and mean molecular weight were carried out at intervals over this period.

The results are given in Table XIII.

TABLE XIII.

Time.	Hydrocyanic Acid Concentration.	Mean Molecular Weight.
0 hours	5·4 mgrs. per 100 c.c.	84·7
24 ,,	5·1 ,, ,,	84·7
48 ,,	5·1 ,, ,,	84·7
120 ,,	5·0 ,, ,,	84·7
384 ,,	5·0 ,, ,,	84·7

An evaporation test was then carried out on the mixture, and the residue given was less than 1 mgr. per 100 c.c., which was no greater than that given before the addition of hydrocyanic acid.

There is thus no evidence from any of these results that hydrocyanic acid combines with benzole at room temperature.

(*b*) *Action of Hydrocyanic Acid under the Influence of Heat.*—In these experiments a benzole-benzene solution of hydrocyanic acid was made as before and then refluxed on a water bath. The quantity of hydrocyanic acid remaining after reflux was determined, and compared with that originally present. To allow for the hydrocyanic acid expelled from the solution by increase in temperature, a control experiment was carried out simultaneously with pure benzene. 100 c.c. of the benzole-benzene mixture was introduced into a flask accurately ground to a long reflux condenser plugged at the top with cotton wool. The solution was then refluxed simultaneously with the control for 1 hour on a steam bath, after which both were cooled, and the hydrocyanic acid present was determined. The results are given in Table XIV.

TABLE XIV.

Solution.	HCN Concentration. Mgrs. per 100 C.C.		Diffusion Loss.	Difference.	Reflux Temperature, °C.
	Initial.	Final.			
75 p.ct. benzole } 25 ,, benzene }	23·0	6·50	11·3	5·2	87·0
100 ,, benzene	23·0	11·70	11·3	..	80·2

The decrease in hydrocyanic acid concentration is 5·2 mgrs. per 100 c.c. greater in the case of the benzole mixture. Referred to the benzole present, the difference is 6·90 mgrs. per 100 c.c.

It was realized that the reflux temperature was higher for the benzole mixture and might conceivably account for the difference. The experiment was repeated, using as a control a

benzene-toluene mixture refluxing at 88° C.; and the results are given in Table XV.

TABLE XV

Solution.	HCN Concentration. Mgrs. per 100 C.C. Initial.	Final.	Diffusion Loss.	Difference.	Reflux Temperature. °C.
75 p.ct. benzole 25 ,, benzene	20·45	10·10	4·70	5·65	87
25·6 ,, benzene 74·4 ,, toluene	20·45	15·75	4·7	..	88

In spite of the slightly lower reflux temperature of the benzole-benzene mixture, there is still a greater decrease in hydrocyanic acid concentration. Referred to the benzole present, the difference is 7·5 mgrs. per 100 c.c., which is sensibly equal to that found before.

The mean molecular weight of the benzole mixture after reflux with hydrocyanic acid was determined, and that of the benzole present was calculated. This was now found to be 83·9, compared with 84·7 previously. Reflux of a similar mixture in the absence of hydrocyanic acid had no result on the mean molecular weight of the benzole as previously stated.

The refluxed benzole mixture was then stored under normal conditions for fifteen weeks, after which an evaporation test was carried out. Referred to the benzole present, the residue found was 51·5 mgrs. per 100 c.c. This should be compared with the residue given by the same benzole unaffected by hydrocyanic acid, which showed less than 2 mgrs. per 100 c.c. after twenty-one weeks.

The results under (*b*) show that a definite combination between some constituent of the benzole and hydrocyanic acid occurs under the influence of heat, which results in the immediate depression of the mean molecular weight and in the ultimate formation of resin. This confirms and throws light on the earlier observations regarding the detrimental effect of heat on saturated charcoal. On the other hand, if the benzole is removed from the charcoal quickly and at a low temperature very little depreciation occurs, and the reason for this is found in the results under (*a*).

The results of the investigation described in Part III. lead to the conclusions:

(1) The constituent primarily responsible for the depreciation of active charcoal by coal gas is hydrocyanic acid.

(2) The removal of hydrocyanic acid from the coal gas used results in great prolongation of the life of the charcoal and in the production of benzole which does not resinify under normal storage conditions.

NEW SHOWROOMS AT BLACKPOOL.

Opening Ceremony.

Another link in the chain of well equipped gas showrooms was forged when the new showrooms of the Blackpool Gas Department were officially opened on Friday, Dec. 6. The ceremony was performed by Councillor P. J. TOMLINSON, Chairman of the Gas Committee, who was accompanied by Councillor D. J. Bailey (Vice-Chairman), various members of the Committee, and Mr. J. H. Chew (Engineer and Manager of the Gas Department).

Mr. CHEW said that the opening of the showroom represented a scheme which on the surface might appear insignificant. Yet, to his mind, it was most important and would have far-reaching effects on the progress of the undertaking. He quoted the position at a famous seaside resort in the South of England where the number of gas fires installed during the four years between 1924 and 1928 had totalled 16,870, and the value of all the gas appliances put into service during the same period had reached £222,700. Yet, in Blackpool, when a census was taken less than a year ago, it was discovered that there were only 1700 gas fires in existence in the town.

There was a large field for the use of gas still unexplored in Blackpool, said Mr. Chew, who advanced the theory that gas contributed materially to the maintenance of national health. Let them think how relatively clear was the atmosphere over Blackpool at noon time in August, he said. Yet at that time meals were being cooked for 300,000 people. And let them try to conceive the conditions which would obtain if coal fires were being used for the purpose. Gas was helping to maintain Blackpool's place in the sun.

Councillor TOMLINSON dispelled two common illusions—the illusion that America was a land fit only for electricians to live in, and that gas was being superseded by electricity in Blackpool. In America, he explained, the sale of gas had increased from 140,000 million c.ft. in 1908 to 490,000 million c.ft. in 1928, and in the United Kingdom 40 p.ct. more gas was being used than in the period immediately before the war. In Blackpool a substantial increase had been maintained, and to-day the output was 1109 millions compared with 683 millions in 1919 and 521 millions in 1909. He recalled that many years ago the Corporation secured powers to deal in gas appliances, but that the exercise of those powers was opposed on the ground that they would be unfair to the interests of the traders. The subject, however, had been revived. They had

Photo by the "West Lancashire Evening Gazette."

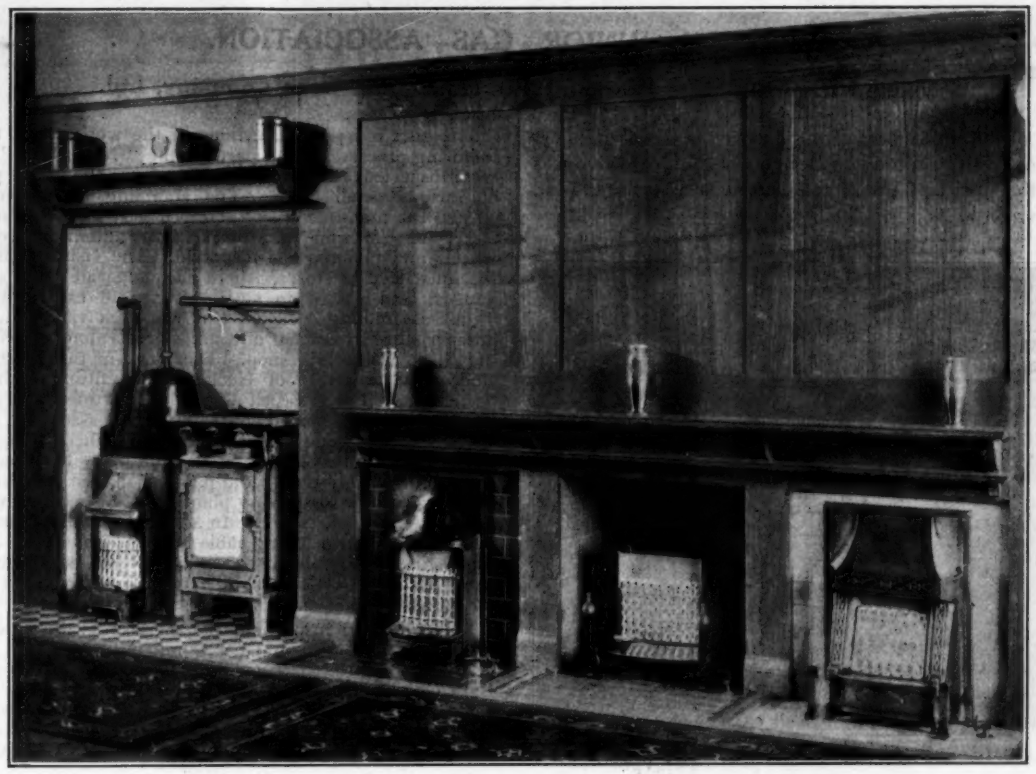


Photo by the "West Lancashire Evening Gazette."

united the co-operation of the traders, and as a result an amicable and common understanding had been reached. In the outcome the speaker prophesied that the arrangement would react to the benefit of the traders, the Gas Department, and the public, and remarked that it was a significant fact that side by side with the expansion in the use of electricity, gas was also making great strides.

Councillor BAILEY said the traders played such an important part in maintaining the welfare of Blackpool that it was not fitting for the Corporation to do anything which might be inimical to their interests unless those interests clashed with the public interests. But now such a position had been reached that the interests of the traders coincided with the interests of the public, and greater progress was promised for the Gas Department.

Immediately after the opening, the showroom was inspected by the Committee.

The showroom and general offices of the Gas Department form one block and occupy a commanding position in Princess Street, near the centre of the town, and approximately 200 yards from the sea front. The need for a well equipped showroom had been felt for some time, and, in consequence, permission was sought and obtained to combine one with a reconstruction of the existing block of offices, including an attached residence.

The reconstruction was designed by the Architectural Department, the building contract being carried out by a local contractor. The exterior view of the showroom clearly shows the importance paid to adequate window area. From these windows unobstructed views are obtained of the showroom interior. The heavy, bold appearance of the showroom exterior is produced by the surrounding artificial stonework. The entrance porch is artistically tiled and is isolated from the main showroom by two swing doors. The general lighting of the showroom has been carried out by the Department's own staff, the main illumination being by means of Sugg's 6-burner ventilating lamps with their patent distance control device. There are eight such lamps operated by tumbler switches in pairs so that the window lights can be left on after the showroom is officially closed. The showroom is comprised of two wings at right angles. The wall of one wing forms the gable end of the building in which exist two chimney breasts belonging previously to the residence. The distance between these two breasts was built up to form a flue to accommodate three gas fires. The breast nearest the window was fitted with a Wilsons & Mathiesons' "Sunbeam" fire, supplied through a gas fire meter of Messrs. J. & J. Braddock. This combination should prove an attractive and businesslike proposition to the hotel and boarding house proprietors of Blackpool, and should do much to popularize the use of gas fires in hotels. Two of the following three fires are of special finish, while the third is an inset fire let into a tiled recess. The hearths and surround are of artistic shades of tiling, and are designed to show the beauty of colouring that can be obtained with modern gas fires—an impressive point with lady consumers. The whole of the gas fires are connected up, and can be shown at work when the occasion demands.

Special importance has been given to the gas kitchen, which has in Blackpool a glorious future. Many people are finding the open coal fire too hot for comfortable working during the summer months, which form the peak of Blackpool's load. Cases have become common where proprietors are experiencing considerable difficulties in keeping a kitchen maid, solely due to the excessive heat from the coal grate working at its maximum on a hot day in summer. In the recess are connected up a cooker of "Rado" finish and a "B.T.U." circulator interconnected to a "Sunhot" boiler. To complete the recess, a 7-radiant gas fire is fitted before the circulator. The recess is white-tiled, and the hearth is chequered in black and white, the whole presenting a clean and inviting appearance. A flue is constructed at the back of the recess to which are connected the flues from the cooker, circulator, and gas fire. Close to the recess is the "Sunhot" boiler, which, as stated, is connected to the circulator, and forms the hot water storage for the whole building. Another feature of the showroom is the Grafton bath connected up with geyser. A baby model "Electrolux" refrigerator is also shown in working condition, and it is hoped that this may prove an attractive investment for hotel proprietors during the summer months.

An extensive range of the latest types of cookers is also a prominent feature, while special attention has been given to radiators. The whole of the showroom is richly panelled in light oak, while the flooring is of polished wood blocks.

A special point has been made to bring to the public the method of automatic control of gas lighting. In addition to the distance control device as applied to the ventilating lamps, there are two "Flambeau" brackets operated by pneumatic switches and an additional bracket by the "Newbridge" positive distance gas switch. The whole of the building is now lit by gas under automatic control, and is the best possible advertisement for modern gas lighting. At the junction of the two wings is an oak cabinet against which are four attractive special finished gas fires, while the top is used for literature.

As mentioned, in designing the showroom, special consideration was given to the "open" type of window, with the result that the interior may be viewed from without by the casual observer, and the artistic display of gas fires appreciated without an interview with the sales staff. Inquiries and complaints are attended to in the showroom, which is so arranged that a full view of the appliances is obtained when the customer walks to the counter for attention.

The accompanying photographs give an indication of the tastefulness with which the interior has been furnished. The entrance is exceptionally striking with two Sugg's hexagonal lamps in antique copper attached by means of brackets to the imitation stone pillars.

The Department is gratified with the great amount of interest which has already been aroused, and feels that the long felt need of a first-class showroom will be adequately met. It will undoubtedly do much to promote still further the sales of gas in Blackpool, and will be a very close tie between the general public and the Gas Department.

WESTERN JUNIOR GAS ASSOCIATION.

Visit to the Newbridge Works of the Horstmann Gear Company, Ltd.

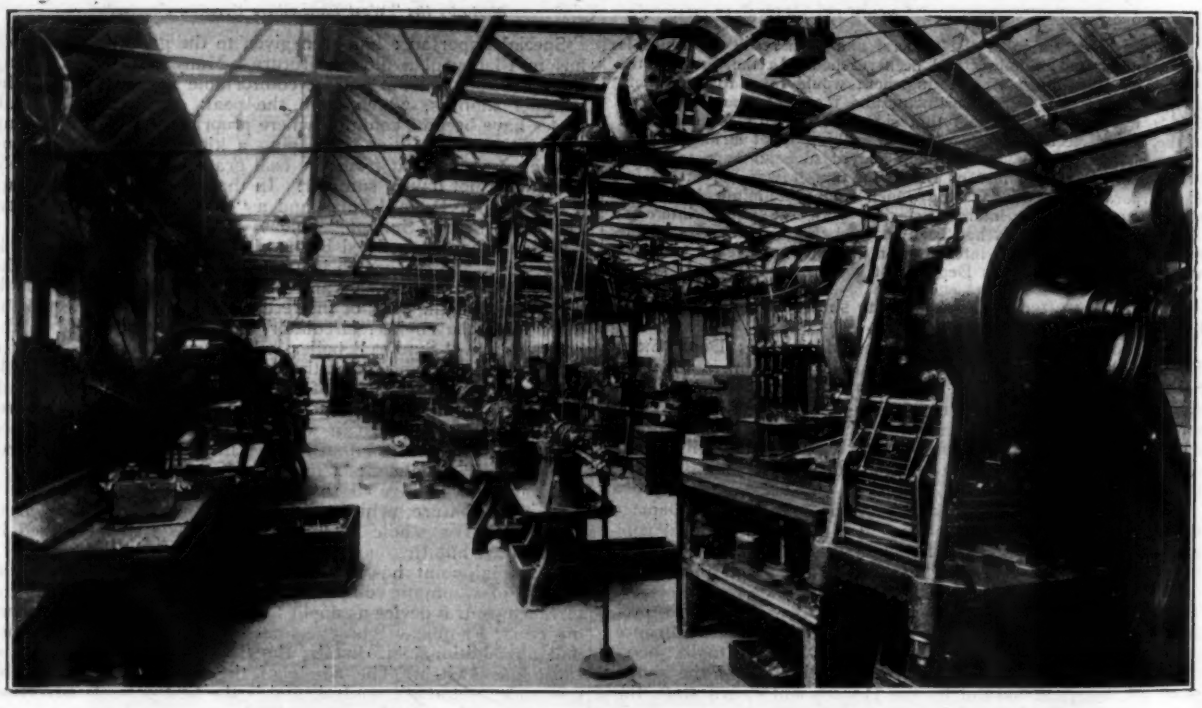
A party of thirty members of the Association spent an enjoyable and instructive morning on Dec. 7, when an inspection was made of the works of the Horstmann Gear Company, Ltd., Newbridge, Bath.

Mikron Machines for Manufacture of Wheels and Pinions.

The visit covered all sections of the works; and the manufacturing processes of all parts of the "Newbridge" controller were inspected. In the capstan bays was shown the production of various small parts. The stamping department demonstrated the manufacture of stamped parts. Following this the battery of "Mikron" machines for the automatic production of wheels and pinions was inspected. The visitors passed on to the finished part stores, where each separate part is tested by gauges, and passed to stock after rigid examination. The "unit assembling" department was next visited, where various parts are assembled into units preparatory to being sent to the clock assembling shop. The work in this department includes the assembly of clock frames, fitting springs inside barrels, &c. The gas cock assembly department and the section devoted to iron box manufacture and assembly were next visited. Then came a tour of the shop where complete movements are assembled, and testing for timekeeping; the chromium plating plant; the paint shop, the sand-blasting apparatus, and the lacquering plant; the finished controller store; and the repair department. In addition, the manufacture of the new gas switch, including cable loading, was seen. A specially interesting section is that devoted to the manufacture of engineering gauges. The manufacture of these gauges often calls for an accuracy of one ten-thousandth of an inch.

Following the inspection, the members were entertained at lunch by the Horstmann Gear Company.

Afterwards, the party adjourned to the showrooms of the Bath Gas Company, when two papers were read—"Gas Sales Policy," by Mr. H. W. Willmer (Showroom Superintendent, Bath Gas Company), and "Gas Switches," by Mr. J. H. G. Horstmann. The latter is published in the "JOURNAL" to-day.



MACHINE BAY AT THE HORSTMANN WORKS.

MANCHESTER AND DISTRICT JUNIOR GAS ASSOCIATION.

Visit to the Oswald Street Gas-Works, Burnley, Dec. 7.

About eighty members of the Association visited these works, which have an area of 29 acres, and are completely new. The railway sidings are connected with the L.M.S. main line. There is a handsome retort house 207 ft. long by 64 ft. wide by 50 ft. high, containing fourteen beds of 10 Ω-shaped retorts. The gas leaves the retorts by "Congdon" scrubber pipes; and the waste gases are passed through a waste-heat boiler which has a working pressure of 200 lbs. The Sulzer coke cooling plant was inspected, as also were other portions of the works and plant, which have been described in the "JOURNAL" for Oct. 31, 1928, p. 337.

The Gas Engineer, Mr. J. H. Clegg, received the members at the works, and, with members of his technical staff, conducted the party around the works.

High tea was served in a works mess-room; the Mayor (Alderman Nuttall, J.P.), the Vice-Chairman of the Gas Committee (Councillor Whitaker), and Councillors Foster, Tomlinson, and Lynch being present.

The MAYOR extended a hearty welcome to the Association, and said how proud they were of the works and of their Gas Engineer.

At the meeting which followed, Mr. N. Partington, B.Sc., A.I.C., of Oldham, read a paper on "Coal Testing Problems." This was published in the "JOURNAL" last week.

CORRESPONDENCE.

[We are not responsible for opinions expressed by Correspondents.]

Mr. C. S. Shapley and the Coal Industry.

SIR,—I see from reports in the Press that Mr. C. S. Shapley, the President of the Institution of Gas Engineers, has been delivering himself of some opinions on the coal industry, and, as I presume you will be reproducing those opinions, I hope you will allow me to comment upon them.

He said that:

(1) *"During the war the Coalition Government thought it necessary to guarantee the profits of the coal industry. The effect of this was . . . that the price of coal rose."*

It is quite true that the owners were guaranteed their pre-war profit, which averaged one shilling per ton for the period 1909-13, but, whereas other industries were allowed to retain excess profits after paying 80 p.ct. of these to the Inland Revenue, the coal industry had to pay an additional 15 p.ct. to the Coal Controller.

Unfortunately, although profits were thus limited, wages did not remain so, and the pernicious habit grew up of the Government conceding flat-rate increases in order to avoid industrial disputes. As a result, average earnings per shift, which had been 6s. 5½d. in 1914, were 16s. 6d. in 1920; and wages costs per ton, which had been 6s. 10½d., were 29s. 8d. at the time of decontrol. Obviously prices had to follow suit. But they followed as a result of the increase of wages, not of profits, and at the decree of the Government, not the coalowners.

Mr. Shapley complains that in 1920 the price of coal in Leeds was 279 p.ct. above pre-war. He seems to have forgotten that, during control, "no coal might, without the consent of the Controller, be sold by collieries for consumption in the United Kingdom except at the maximum prices chargeable under the Price of Coal (Limitation) Act and the Coal (Pit's Mouth) Price and Orders Nos. 2 and 3, 1918."

(2) The coal industry *"always seeks to maintain its dividends by passing on the whole of its losses or increased costs of production to the unfortunate home consumer."*

This is simply untrue. At the time of decontrol in 1921, costs other than wages were 10s. 7d. per ton. They are now 4s. 8¼d. Moreover, since the resumption of work after the stoppage, the industry had lost up till June, 1929, £13,690,363. Yet even now the average pithead price of coal is only 23½ p.ct. above pre-war, as compared with a figure of 35½ p.ct. for general wholesale prices.

(3) *"The coal industry in times past, and over a range of years, has been wonderfully prosperous."*

The Samuel Commission Report (p. 218) contains a table of profits going back to 1889. For the 25 years before the war the average profit was only 1s. 0¼d. per ton.

Nor is that all. In those days colliery undertakings could accumulate out of good years reserves out of which to make provision for bad years. That is no longer possible to anything like the same extent since, under the proceeds-sharing agreement, 85 p.ct. of the proceeds of the industry, *whatever they may be*, after paying costs other than wages, go to wages. Thus in a good year the workers take their full share at the time, and in a bad year the owners not only do not get their share at all, but have to make up the minimum wage out of their own pockets.

(4) Mr. Shapley commends the proposal to *"close the uneconomic pits."*

By what method are they to be selected, and upon whose authority are they to be closed? We have not quite arrived at the stage where a Socialist Government can declare that A and B may remain in business and C and D cease forthwith.

(5) Finally Mr. Shapley trots out the old question of the difference between the pithead and the retail price of coal.

He quotes 50s. a ton for the latter, whereas current quotations in Central London for Bright House Coal are 48s. May I ask him to consider the following table?

	s.	d.
Quotation for bright house coal (about 1 p.ct. of the total output of a colliery) at the pithead. (Board of Trade Journal, Nov. 28, 1929.)	25	6
Transport charges to London	11	11
Distribution costs (without profit). See Samuel Commission evidence. (Comparable figure for Co-Operative Societies, 11s. 5d.)	10	2
	47	7

In conclusion, I would observe that, before the consumer is in a position to offer what Mr. Shapley calls "healthy criticism," he should get his facts right. Mr. Shapley does not seem to worry unduly about his facts.

PHILIP GEE.

5, *New Court,*
Lincoln's Inn, W.C. 2,
Dec. 13, 1929.

Edinburgh Waterless Gasholder.

SIR,—My attention has been drawn to the letter in your issue for Dec. 4 over the nom-de-plume "New Age;" and if the party will communicate with me direct, I shall be pleased to give him the information he desires.

H. H. GRACIE,
Engineer and Manager.

Edinburgh Corporation Gas Department,
15, Calton Hill,
Edinburgh, Dec. 6, 1929.

Structural Engineering Regulations.

SIR,—With reference to the notes on Structural Engineering Regulations in the "JOURNAL" for Dec. 11, since these notes appeared in the November issue of "West's Gas" the writer has been asked many times whether, after considering the recent exceptionally heavy gales, he has radically altered his views on wind pressure. The answer is a decided negative.

The generally adopted formula for wind pressure deduced from experiments carried out at the National Physical Laboratory (Vol. CLVI., Proc.Inst.C.E.) is $p = 0{\cdot}0027V^2$, where V = the velocity in miles per hour, and p = the pressure in pounds per square foot. Now, taking the recent gale of 108 miles per hour, the resultant pressure equals 31½ lbs. per sq. ft., and taking Irminger's figure (Trans. Inst. of Gas Engineers, Vol. IV., 1899) of $0{\cdot}42p$ for the pressure on the sides of buildings similar to ordinary retort house buildings, the actual pressure is only 13¼ lbs. per sq. ft.

It will be interesting to all gas engineers to know that Mr. Irminger is still carrying out experiments on wind pressure in Denmark; and in our country this subject will be treated very fully in the near future by a Research Panel in connection with the new British Steel Works Association and a Government Research Board, including one or two consulting engineers. The results of the conference will be looked forward to with interest.

A. E. PIERCE, M.I.Struct.E.,
Chief Draughtsman,
West's Gas Improvement Company, Ltd.

Albion Ironworks,
Miles Platting,
Manchester, Dec. 13, 1929.

PARLIAMENTARY INTELLIGENCE.

[From Our Special Correspondents.]

HOUSE OF LORDS.

SPECIAL ORDERS.

A Special Order in respect of the Borough of Chorley has been laid before the House and referred to the Special Orders Committee.

The Watford and St. Albans Gas Order and the Halstead Gas Order, having passed the Special Orders Committee, have been approved. In the case of the Halstead Order, a lengthy clause was added "for the protection of the Essex County Council."

The East Hull Gas Order and the Hertford Gas Order are still awaiting consideration by the Special Orders Committee.

HOUSE OF COMMONS.

SPECIAL ORDERS.

The Borough of Chorley Gas Order was presented to the House and ordered to lie upon the Table for the usual period.

The Halstead Gas Order, with the addition of the clause "for the protection of the Essex County Council," was brought up for approval. The clause regulates the breaking-up of roads for the laying of gas mains, and contains a proviso for arbitration in the event of differences arising between the County Council and the Gas Company. The first two paragraphs of the clause are as follows:

(1) In the case of any trunk mains to be laid down by the Company under the powers of this Order, the Company shall not

permit any trench made by them in any main road vested in and maintainable by the County Council to be open for a greater consecutive distance than four hundred yards, if in such length of four hundred yards there is not room throughout for two carts to pass one another, and in the case of any other main to be laid down in any such road under the powers of this Order there shall not in like circumstances be more than two hundred consecutive yards in length of trench open at any one time, and the Company shall, if and when required by the County Council or their Surveyor, provide to the satisfaction of the County Council for the regulation of traffic while any trench referred to in this sub-section shall remain open.

(2) In approving the plan to be delivered to the County Council under section 9 of the Gas-Works Clauses Act, 1847, the County Council may require that all mains and pipes of the Company shall, wherever practicable, be laid in or at the side of the road; and if any main or pipe of the Company shall be laid below the surface of the carriageway of any main road at a depth of less than 2 ft., the County Council shall not be liable for or in respect of any damage or injury which may be caused to such main or pipe by the use by the County Council of any steam or other roller for the repair of any such road, or of any traction engine belonging to the County Council, provided that such roller or engine does not exceed 12 tons in weight.

Commander WILLIAMS, M.P. for Torquay, pressed for some explanation of this clause, particularly in its relation to the rights of the County Council.

Col. ACLAND-TROYTE, M.P. for Tiverton, raised the point that the County Council was not liable to pay for damage caused to pipes in certain circumstances, and asked if other landowners were liable in such cases.

Mr. W. R. SMITH, Parliamentary Secretary to the Board of Trade, said that certain objections to the Order had been raised by the Railway Company and the County Council, but that the Railway Company had withdrawn their objection, while the County Council had not. Rather than hold up the proceedings any further, it had been agreed to add this clause, and all opposition had now been withdrawn.

Earl WINTERTON asked if the clause did not conflict with the new Road Traffic Bill in regard to damage done to roads.

Mr. SMITH replied that it was difficult to say how far the Order might clash with proposed legislation.

Commander WILLIAMS continued to press for an answer to his question, but Mr. SMITH was unable to give a detailed explanation, as notice had not been given in advance of the points raised so that inquiries could be made. He repeated that the whole position was now agreed to between the parties concerned.

Lord EUSTACE PERCY protested against this attitude, and moved the postponement of the Order.

On a division, the Order was approved by 116 votes to 46.

The Watford and St. Albans Gas Order was then brought up for approval, and Commander WILLIAMS again protested against the Minister's unpreparedness to deal with criticisms.

The Order was approved without a division.

Birmingham Corporation Bill.

Amendments to the Gas Clauses of the Birmingham Corporation Bill mark an important line of policy which may be adopted in future by the Local Legislation Committee of the House of Commons. They provide that profits on the gas undertaking shall be applied to the formation of a reserve fund up to a limit of £200,000, and that after March 31, 1933, charges shall be not more than sufficient to avoid a loss on the undertaking.

Smoke Abatement.

Dr. HASTINGS asked the Minister of Health if model by-laws had been issued by his Department to assist local authorities in framing by-laws regulating the emission of smoke from buildings in accordance with section 2, sub-section 1, of the Smoke Abatement Act, 1926; and how many local authorities had issued such by-laws since the passing of the Act.

Mr. GREENWOOD said that a model by-law had been issued for use under section 2 of the Act of 1926, and 73 local authorities had made by-laws under this section.

Dr. HASTINGS asked the Minister of Health how many convictions were secured by local authorities in 1928 for the emission from buildings of smoke of such a character as to constitute a nuisance.

Mr. GREENWOOD said he regretted that this information was not in his possession.

MISCELLANEOUS NEWS.

THREE GAS COMPANIES TO AMALGAMATE.

Cheltenham, Tewkesbury, and Winchcombe.

An article which appeared recently in the "Cheltenham Echo" announced the intended amalgamation of the local Gas Company with two of its neighbours—Tewkesbury and Winchcombe.

It was stated officially that consumers in Tewkesbury and Winchcombe may be assured of an ample supply at a cheaper rate. There is every prospect of a reduction in price to them—somewhere in the neighbourhood of 1s. per 1000 c.ft., or nearly 20 p.ct. of the total price they are now paying.

THE TENDENCY OF THE AGE.

In bringing about such an amalgamation the Companies, it was remarked, are falling into line with the tendency of the age, a tendency that cuts out the waste due to overlapping, useless competition, and unnecessary duplication of plant. Cheltenham is capable of coping with a much greater output even than that implied by the addition of Tewkesbury and Winchcombe, and to do so with overhead expenses remaining practically the same. At the Cheltenham works any expansion necessary in connection with the rapid growth of consumption of gas in the town, or possible growth in the amalgamated districts, can easily be dealt with; and while Cheltenham will not suffer, the smaller towns now running their own installations will benefit to the extent already said. As the demand increases, the price of gas in Cheltenham will tend to decrease, a fact shown yearly by the returns for the past five or six years, during which the cost per 1000 c.ft. has dropped from about 5s. to 3s. 5d. on a much larger sale.

One reason that has made the amalgamation of the interests of the three towns very desirable is that of the claims of the large surrounding districts into which they have been gradually penetrating. The Cheltenham Company's mains, for instance, already reach to Gotherington and Cleeve Hill in the direction of Winchcombe, and the Company is constantly getting applications for gas from outlying areas. Having got to one village, the next village wants to be connected up, and the Cheltenham Directors, faced by this ever-extending demand, felt that the time had come to have a definite objective far enough away where they could utilize the means of storage already existing.

Tewkesbury will be used for storage, but Winchcombe is not sufficiently far away from existing Cheltenham mains to render necessary the utilization of the small holder there, which is situate at the lowest point of the town, but which, of course, could be used if necessary. The Cheltenham main will be continued from the top of Cleeve Hill to Winchcombe

The main to Tewkesbury will be a continuous steel main of 6-in. diameter, constructed to work under pressure, but it is anticipated that at the start only slight pressure will be needed. Numerous applications from villages have been received, and one of the reasons for the amalgamation was the desire to link up the villages. There is no idea of a connection between Tewkesbury and Winchcombe. In this direction, Tewkesbury already supplies Ashchurch, and whether, later on, business is done at Bredon, Kemerton, and other places on that side of Tewkesbury, will depend upon whether the demands from those places represent economic business propositions. If they do, the Company will extend their mains.

THE CHELTENHAM EQUIPMENT.

An advantage, in addition to lower cost, that will be gained by Winchcombe and Tewkesbury consumers is that Cheltenham is in a position to supply gas of a definite tested and guaranteed quality under the Gas Regulation Act, which is not the case to-day in either of the other towns concerned. It may be added that the gas will also be a dry gas, for in very recent times the Cheltenham Company have erected a gas-drying plant at their works to prevent the accumulation of water in the pipes, with the attendant flickering of light and the visits of workmen for the periodical pumping-out necessitated by such accumulation.

Another important recent addition to the works is that of a very large new laboratory.

EUROPEAN BENZOLE CONFERENCES.

A meeting of a small Committee of the International Conference of Benzole Producers was held at Buchum, Westphalia, on Thursday, Dec. 12. The present conditions of the market were reviewed, and the meeting was followed by a visit to the Research Laboratories of the German Benzol Verband.

The Press has attached undue significance to the aims and objects of the first International Conference of Benzole Producers recently held in Paris. It was never the intention to form an International Combination in the manner which has been suggested by a section of the Press. The meetings have for their object the periodical exchange of views with regard to the best method to be employed in marketing and encouraging the use of benzole as a motor fuel in all countries, and the standardization of benzole specifications.

Both English and German benzole producers already have their separate organizations for marketing benzole, which is sold mainly in the form of a blended mixture. The marketing organization in this country, which is owned and controlled entirely by the producers of British benzole, is the National Benzole Company, Ltd.; and the form in which the British benzole is sold is as an admixture branded as "National Benzole" mixture. The use of benzole as a motor fuel is becoming increasingly popular in both England and Germany.

A USER'S VIEW OF THE COAL PROBLEM.

[From a speech delivered by Mr. C. S. Shapley, President of the Institution of Gas Engineers, before the Leeds Luncheon Club, Dec. 9.]

In pre-war days the coal industry was not only supplying a very cheap fuel for home industries, the public utility undertakings, and the general public, but was also largely responsible for London being the money market of the world, by the fact that the industry was able, owing to the low prices at which it was then producing coal, practically to flood the export market with supplies of cheap good-class fuel.

Any marked increase in coal costs will have the effect not only of reducing exports, unless subsidized, but of increasing the cost of manufacture of all manner of things, and, in view of the high cost of living, of further restricting the comfort of the general public.

In all the deliberations that have taken place of late, consideration seems to have been given only to the problem of export coal, which is to be exempt from any increase, and even to be subsidized at the expense of industry in general and of the community. During the war, the Coalition Government thought it necessary to guarantee the profits of the coal industry. The effect of this was, in so far as the gas industry in Leeds was concerned, that the price of coal rose from 9s. 11·3d. per ton in 1910 to 37s. 7·7d. per ton in 1920, or 279 p.ct. above pre-war. This had the effect of raising the cost of living—because the extra cost of coal was passed automatically on to the gas consumer—and of reducing the dividends paid by gas companies in accordance with a sliding scale. Thus, at a time when the coal industry was placed in a false position by the guarantee of profits by the Government, the Gas Light and Coke Company were not paying a dividend of 2 p.ct. on capital invested, while their stock was standing at considerably under £50 per £100; and this was common throughout the country.

Contrast this with the attitude of the coal industry which always seeks to maintain its dividends by passing on the whole of its losses or increased costs of protection to the unfortunate home consumer.

What has the gas industry done to economize in the use of coal? In Leeds, in 1902, we made 3000 million c.ft. of gas per annum, and consumed 300,000 tons of coal. To-day we make more gas and use 100,000 tons of coal less. The moral of the story is that the gas industry, owing to the high costs of coal, has organized its businesses from within, and taken full advantage of the research work done by the University of Leeds, the Fuel Research Board, and others, with the result that the demand for coal at home has been substantially reduced.

WHY THE PRESENT POSITION?

The consumer would appear to me to be in a position to offer healthy criticism. It would be natural to ask why the coal industry is said to be in such a precarious position, having in mind that during the war it enjoyed greater privileges than any industry in the country, returned handsome profits, and paid very satisfactory wages. The fact is that this very position was conducive to the relaxation of enterprise, from which it is no doubt suffering to-day. Are these artificial conditions, created at a time of undoubted prosperity, to remain unchallenged or unrectified, and is the industry to be perpetually subsidized by Act of Parliament, and given unrestricted power to inflict upon the general public terms which will make good its own shortcomings?

I have some experience of Governmental intervention and legislation in industry, in connection with public utility undertakings; but in my personal experience, the intervention of Parliament has always been directed towards the safeguarding of the public against excessive charges, and the restriction of the profits generally, with a provision that lower prices due to good management shall permit a slightly better award.

Under the selling organization suggested on behalf of the coal industry, however, I see no reference to any limitation of profits or premium on good management, but rather a price-fixing arrangement which will engender a lack of enterprise and economic working.

One might reasonably ask why all this attention is being paid to one industry of the land. I doubt not that we are all concerned with some phase of industry which passes through the vicissitudes that the coal industry is experiencing. Is the woollen industry, the cotton industry, or the engineering industry in a better or a worse plight than the coal industry? The answer is, undoubtedly, worse. Yet, if the proposals we read of fructify, it must inevitably be that their difficulties will be considerably increased. Industry cannot be regarded sectionally.

If you will look at the records you will find that the coal industry in times past, and over a range of years, has been wonderfully prosperous; huge dividends have been paid, and capital has been inflated. [Mr. Shapley quoted specific instances of individual concerns in support of his view.] The withdrawal of every ton of coal from the shaft reduces the life of a colliery, and therefore depreciates its capital value. The tendency in the industry, therefore, should have been to reduce, rather than to inflate, capital values.

Though legislation may help to bridge-over the present difficulties, any improvement must be internal rather than external, and it is only by the adoption of modern methods and co-operation between employer and employee that any lasting benefit can be gained.

The owners' only remedy to meet their condition seems to be to increase the price of coal, which is already too high, to permit uneconomic pits to work, and to enable economic collieries to pay dividends on watered capital. If coal owners attempt to push up coal prices, industry has the right to demand a full statement as to the costs of production, in which direction I venture to suggest many collieries have for years been working on a grossly wasteful basis. From personal observation of the boiler plants commonly employed at collieries, I have no hesitation in saying that the coal industry has many lessons to learn from other industries as to the economic utilization of coal. An explanation is required, for instance, as to why 1·14 cwt. of every ton of coal raised was absorbed in 1928 for engine fuel, and whether the amount of free coal given to the men does not encourage prodigality of usage. Contrast this with the Leeds Gas Department, which has reduced its annual coal consumption from 300,000 tons to 200,000 tons, though there is a substantial increase in the quantity of gas made, per annum. Regarding the electricity industry, I find that technical developments have resulted in an all-round increase of 58 p.ct. in the amount of electricity now obtainable per ton of fuel consumed, compared with the position in 1920-21.

LABOUR DIFFICULTIES.

Unfortunately, labour difficulties have played an all too important part in the history of the coal industry. In saying this, of course, I do not speak from a political standpoint. The settlement of these troubles has not been marked with either conspicuous success or ability; and here again the coal industry can learn much from other industries.

I happen to be connected with the Industrial Council governing the working conditions of the men in the gas industry; and we find no difficulty in dealing with cases either from an employer's or an employee's standpoint, and the organization is such that the decision of the ruling council is operative on all concerned.

The chief reason probably is that the representatives of the gas employers are men actively engaged in the industry—that is to say, the gas engineers, who are men of considerable practical experience and have the confidence of their staffs. In labour negotiations the coal employers are represented by the mine owners, who, with some exceptions, cannot possibly have the experience of their colliery managers; and thus it is that the amicable relations of the gas industry—taking this as an example of others—is not to be seen in the coal industry.

MARKETING SCHEMES.

A fundamental factor in the marketing scheme of the coal owners is a restriction of output, which falls upon the successful as well as the unsuccessful mine, in order to reconcile the potential output of the industry of 330 million tons per annum with the saleable output of 250 million tons. But it is an economic fallacy to think that restriction of output will improve the condition of industry, because such restriction means that the owners get no more—the higher price being off-set by the decreased output—the workers earn less in proportions to the limitations on output, and the unfortunate consumer pays more. One suggested solution is the closing of the uneconomic pits, which does not necessarily mean the small pits, but those which cannot produce and sell coal at an economic price. Sir William Beveridge and Sir Richard Redmayne, who for many years was Chief Government Inspector of Mines, are advocates of this policy.

If the law of economics had been allowed to operate freely, the uneconomic pits would have suffered the natural extinction common to similar organizations in all other industries; but the coal industry had been taught to look to the Government and indirectly to the consumer to succour its hopeless weaklings.

The public utility undertakings, which are the largest users of coal, are prepared to play a proper part in the settlement of the affairs of the coal industry; but they require an explanation of many matters. Why, for example, should the cost of coal to the Leeds Gas-Works in 1928 be 92 p.ct. above the figure of 1910 (which was a profitable year according to the Chairman of the Central Collieries Commercial Association), and why should the householder be called upon to pay approximately 50s. per ton for house coal which he was able to buy pre-war at 16s., when it is generally known that the cost of labour in the production of coal forms a very large percentage of the total cost, and we are told that the miner is only receiving from 50 to 54 p.ct. above pre-war in the shape of wages. How is the difference to be accounted for? An explanation of this would be very helpful.

It is urged that the increased cost of production is largely due to increased taxation, but every industry has to shoulder this burden, and collieries are in no worse a position than is any other industry. Indeed, they have an advantage, inasmuch as the De-Rating Act gives substantial relief to the industry, while some other industries have been excluded from the measure.

It would appear, then, that the benefits to be derived from de-rating, the introduction of economies, the closing of uneconomic pits and the establishment of a better understanding between employers and employees, in order to remove that bitter strife strangely peculiar to the coal industry, are avenues to be explored to bring the industry back to prosperity.

GAS POISONING COMMITTEE.

[For Earlier Evidence see "JOURNAL" for Oct. 16, 23, 30, Nov. 6, 13, 20, Dec. 4, 11.]

The evidence given by Mr. Stephen Lacey and Mr. H. D. Madden (on behalf of the National Gas Council) on Thursday, Dec. 12, to the Committee appointed by the Government to inquire into the danger of accidents by coal gas poisoning, was such as to reflect credit upon themselves and upon the gas industry as a whole for the efficient manner in which gas is distributed and used.

Mr. Stephen Lacey, B.Sc., Assoc.M.Inst.C.E., M.Inst.Gas.E. (Distributing Engineer to the Gas Light and Coke Company), dealt with matters concerning mains and service pipes in highways. He was responsible, he said, for the laying and maintenance of mains and service pipes in an area of supply of about 265 square miles, in which the conditions as regards gas distribution might be taken as being fairly representative of the whole country.

If every leakage that could be detected by practicable methods were stopped, he continued, there would still be escapes of gas which, though individually negligible, would in the aggregate amount to an appreciable quantity in relation to the volume of gas distributed. It had been suggested to the Committee that what was called "unaccounted-for gas" was a measure of the quantity of gas escaping from the mains and services undetected, but he emphasized that this was not so. Gas unaccounted-for was really a "book" figure, and represented the difference between the gas made, as measured by the works meters, and the gas sold, as measured by the consumers' meters. He pointed out that the volume of gas varied in accordance with the temperature and atmospheric pressure, and that the conditions of measurement as regards temperature and pressure were obviously not the same, but often widely different, at the works where the gas was made and in the premises where it passed through the consumers' meters. The difference accounted for part of the unaccounted-for gas. Further, whereas the station meters were accurate, as a rule, to within ½ p.ct., the aggregate amount of gas sold, as measured by the consumers' meters, was below—sometimes substantially below—that actually delivered.

He had made experiments with the object of determining directly the upper limit of leakage from mains and services expressed as a percentage of gas made, and had come to the conclusion, which was fully justified by evidence which he could give if desired, that the undetected leakage from mains and services together was certainly less than 1 p.ct. of the gas made, and probably very much less. In the area of supply of the Gas Light and Coke Company there were 4000 miles of mains, and 1 p.ct. of the gas made represented about 14 c.ft. per hour per mile of main. The total length of mains was about twice that of the streets in which they lay, so that on the average there were about two mains in every street, and the undetected leakage might be expressed as 28 c.ft. per hour per mile of street. This was roughly 1 c.ft. per hour for every 10,000 sq. ft. of road surface, assuming the average width of the roads to be 50 ft.

It was his considered opinion that, taking all things into account, the underground leakage from gas mains and services was substantially less than it was twenty years ago, and that it was still being reduced. It was true that the continually increasing number, weight, and speed of vehicles tended to increase leakage, by vibration transmitted to the mains *via* the subsoil. On the other hand, roads designed to resist the wear and tear of heavy traffic were more effective as a protection of the mains and service pipes from damage than were the old water-bound macadam roads. They afforded protection from frost as well as from the effects of traffic. Again, he pointed to the fact that road surfaces were maintained in a much smoother condition than in the past, and that an increasingly large proportion of vehicles have rubber tyred wheels. On balance, he did not think that modern road conditions were anything like so prejudicial to mains lying in the subsoil as was commonly supposed.

Road Surfaces.

As to the relative imperviousness of road surfaces, he agreed that an escape of gas of a magnitude which, under a water-bound macadam road, would normally escape harmlessly to the atmosphere through the road surface, would be a potential source of danger under a modern road. On the other hand, it must be borne in mind that, while a macadam road was relatively pervious to gas during the greater part of the year, in severe winter weather, when there might be frozen snow on the ground, or ice in the road itself, the road surface became impervious, and leakages of gas would be held in the road. The degree of perviousness of a modern road was relatively little affected by weather conditions, so that the work of leakage detection and location was not so largely confined to the winter months as it used to be. This was a great advantage, because it was in the winter months that mains and services were most liable to damage, and it was clearly undesirable that leakages occurring in the summer should continue undetected until winter. The so-called gas-tightness of modern roads had been much exaggerated. In fact, there was a very large number of street boxes which acted as ventilators, though not designed to do so. In this connection he mentioned the boxes over the standpipes connected with the gas main for the removal of water condensing from the gas, and the boxes over spindles of water valves. Further, the ducts for telephone, telegraph, and electric supply cables, and the junction boxes to which they were connected at frequent intervals, served not only as ventilators, to a limited extent, but also as means of leakage detection. If they were more effective as ventilators, however, they would be less useful as a means of leakage detection. There could be no doubt that the combination of the nearly impervious road surface and the existence of the duct lines and boxes resulted in the early detection of many small leakages of gas which would remain undetected if occurring under a more permeable road surface. A considerable proportion of gas escaping under a road from defects in the gas mains found its way into the cable duct lines and the junction boxes connected to them. The latter were not deliberately ventilated, and consequently gas entering them *via* cable ducts found no easy outlet, and tended to accumulate and become increasingly concentrated. When the boxes were opened, as they were very frequently, even a very small percentage of coal gas in them was detected by smell. The employees of the Post Office and the electricity supply authorities had instructions to report escapes of gas to the gas undertakings, and a considerable proportion of the reports received came through these channels. Also, he pointed out that the employees of the gas undertakings searched for escapes. The Gas Light and Coke Company and many other gas undertakings employed men to examine every trench opening and to test periodically with a leakage indicator the road boxes of all kinds.

In view of the usefulness to the gas industry of unventilated street boxes as an aid to the rapid detection of escapes, he added, it might well be asked why the ventilation of large underground boxes was so strongly advocated during the inquiry into the Holborn explosion. The answer was that the danger from explosions in large underground chambers was the determining factor, in spite of the fact that, if ventilation of such boxes were provided, the advantages of early detection would be to some extent lost. If effect were given to the recommendation of the Commissioners appointed to inquire into the Holborn explosion—that large junction boxes or chambers (those into which a man must descend in order to make alterations or repairs) should be ventilated—the risk of serious damage by explosions in large chambers would be greatly reduced, while the small boxes, of which there were a very large number, would still serve to give evidence of escapes of gas into the duct lines. The risk of serious damage by explosion in these small boxes as a result of their not being ventilated was slight.

Ventilation of the Subsoil.

Mr. Lacey went on to deal with the various claims which had been made during the last few months for methods of ventilation of the subsoil under impervious pavings by means of gratings placed over the line of main, with or without the addition of rubble drains over the mains between ventilators. The principal claims made were that they would prevent accumulations of gas under the roadway, and would render the location of escapes easy.

Such ventilators, he said, would no doubt, when in good condition, allow of the diffusion of small leakages of gas without detection, but it was doubtful if this were an advantage. With large leakages it was very unlikely that the ventilator would allow of the escape of gas sufficiently quickly to prevent its spreading under the carriageway. The amount of ventilation depended, of course, upon the number of ventilators in a given length of road, and the size of each. As all gratings and similar apparatus inserted in the road resulted in uneven wear of the surface, the number of ventilators should be reduced to the minimum. With regard to the suggestion which had been made to the Committee that 50 yards was the minimum distance apart at which ventilators should be placed, he said that, from experience in leakage detection, it could be stated definitely that this distribution of ventilators would not be effective for clearing the gas from any serious escape. He pointed out that it was frequently found, when searching for an escape of gas, that the gas had taken some particular "run," probably through ground disturbed by the laying of underground plant, and that no trace of gas could be found a few yards either side of this "run." Consequently, if the ventilator did not happen to be on the line taken by the gas, it would be useless. The "run" taken by the gas was not necessarily along the line of main on which the escape occurred, but might be along some duct line or water main.

While rubble drains laid over the tops of the mains between ventilators would no doubt be effective when first laid, they would constitute large spaces for the accumulation of explosive mixtures, and would to that extent increase the danger from escapes of gas. Further, the rubble would be disturbed whenever a cross trench was cut by some other authority, and it was unlikely that such a drain would be effective for long. A leakage on an adjacent water main might well result in the silting-up of the rubble drain. When there were several gas mains in one street, the rubble drains would take up a considerable proportion of the subsoil, and a large free space would be available for the collection of gas should the ventilators become blocked. There was always a risk of the ventilators becoming blocked by mud in wet weather or by snow and ice in cold weather, when escapes were most liable to occur.

As to the location of escapes, the provision of ventilators at every 50 yards and rubble drains in between would, at best, only locate the escape to within from 50 to 100 yards. It was very seldom that under present conditions an escape could not be located to within a shorter distance than that. The rubble drains would make the location of escapes more difficult by giving an easy run for the gas over the length of drain between ventilators. In well-consolidated ground an escape could frequently be located to within a few feet without difficulty.

Sealing of Wall Openings.

It was clearly of the greatest importance, however, that escaping gas should find an easier way out of the subsoil by way of the road surface than by way of the foundation walls of buildings, and for

this reason he supported strongly those who had laid emphasis upon the necessity of cementing up all holes cut into the foundation walls of houses when service pipes of any kind were laid or relaid. It was not always sufficient to seal the spaces between the outside of the pipe and the brickwork. Any pipe carrying an electric or telephone service should be sealed inside the pipe—*i.e.*, between the inside of the pipe and the cable it carried. This question was considered during an inquiry held in June, 1927, on behalf of the Electricity Commissioners, into the matter of an explosion which occurred at Acton, with resultant loss of life and destruction of property. The explosion was found to be due to bitumen gas (generated by the fusion of an electric cable laid in bitumen) obtaining access to a house via the pipe carrying the service cable. The Electricity Commissioners, in their eighth annual report, had stated that the views expressed by the inspectors had been carefully considered, and that, pending a decision as to the amendment of the regulations, they had addressed a communication to all authorized undertakers indicating "that all services into consumers' premises should either be laid solid or taken into the premises in such other manner as to prevent any influx of gas at the point of entry."

The question was of equal importance in relation to telephone services.

There was also the possibility of gas obtaining access to buildings by way of porous foundation walls, and in his experience risks of this kind were confined almost entirely to very poor districts where the road constructions were modern and the buildings old and in bad condition.

During the last ten years there had been four cases in the area of supply of the Gas Light and Coke Company where gas escaping from mains and services had obtained access to buildings, with fatal consequences. Education of the public with regard to the necessity for reporting gas escapes was very important; and in this connection he said that in one of the fatal cases to which he had referred gas was smelt many hours before it was reported.

MAINLAYING.

Discussing possible improvements in mainlaying, &c., he said that, if damage caused by vibration and ground movements was the only cause of leakage, there was no doubt that steel would be used more generally than at present, instead of cast iron. But corrosion had also to be considered, and in that respect cast iron had the experience of a century to recommend it. Steel mains laid underground were invariably provided with a protective coating, and it remained to be proved how long such a coating would last.

It was often assumed, without sufficient evidence, that the depth at which mains were laid was a factor of outstanding importance in safeguarding them from damage. While he agreed that mains under modern roads should be laid at a greater depth than that at which they had been laid in the past, he considered that the importance of depth was often exaggerated. Of far more importance was the solidity and uniformity of the ground in which the mains were laid. He always hesitated before disturbing a main which, though laid nearer the surface of the road than it would be laid to-day, had become well established on a sound foundation. Many such mains were in thoroughly good condition.

In conclusion, Mr. Lacey referred to the work of examination of the mains in Victoria Street, Westminster, which work was nearing completion; his reason for doing so being that the references made to it by more than one witness suggested that the purpose of the work had not been recognized. The facts were that on March 7 last a meter tester employed by the Metropolitan Water Board had reported that he could smell gas in a water meter pit in the carriage-way. Many examinations were made, not only of the pit, but also of the surrounding boxes, but the amount of gas in evidence was so small that it was not until the middle of May that it was decided to open ground. Wedge holes were then made over joints in the 48-in. main, and searcher bars were driven to the level of the bottom of the main, and an indication of gas was found in three of these holes near the water meter pit. Two or three joints on the 48-in. main nearest the water meter pit were opened and repaired, and the smell of gas in the pit disappeared. So far as the reported escape was concerned, the work was then finished, because, in spite of the fact that there was a very large amount of telephone and electric plant in that part of Victoria Street, no gas could be detected by the employees of the various authorities or of the Gas Company. Nevertheless, the Company had followed the usual practice, which was to proceed with a joint-by-joint examination of a main on every occasion when a gas escape had been reported, and to continue until they came to a part of the main where the joints were absolutely sound. This work of remedying escapes before they were large enough to make themselves evident was slowly but surely leading to a substantial reduction of the amount of undetected leakage. Wherever possible, such work was done when roads were being repaved.

[Our report of the remainder of the sitting, which was devoted to the evidence of Mr. H. D. Madden, Chief Engineer and Manager to the Cardiff Gas Company, will be published in the "JOURNAL" next week.]

Correction.—On p. 725 of the "JOURNAL," last week, Mr. Thomas Hardie was reported as having stated that 1000 million c.ft. of gas per annum is used for industrial purposes in Birmingham. This should have read for industrial *heating*. For industrial purposes, 3000 million c.ft. of gas is consumed per annum in Birmingham.

GAS IN THE SERVICE OF THE COMMUNITY.

Address before Hastings Chamber of Trade.

"Gas in the Service of the Community" was the joint title of addresses in which Mr. C. F. Botley, M.Inst.C.E. (Engineer and General Manager of the Hastings Gas Company), and Mr. W. M. Mason (Manager of the British Commercial Gas Association) made some interesting revelations at a meeting called by the Hastings and St. Leonards Chamber of Trade, at the Town Hall on Monday, Dec. 9.

Mr. BOTLEY said for 117 or 118 years they had gone on serving the public with a high degree of efficiency. Nowadays until one advertised people seemed to think that one was a back number and all sorts of things, and to appear up to date one had got to advertise.

Proceeding to give statistics, Mr. Botley stated that there were 18,000 consumers supplied by the Company, which implied that most people had something to do with gas. The area over which their service extended was 70 square miles, and there were 120 miles of main. More than 9000 cookers were lent to the consumers, and that was only a small proportion of the number in use as many were owned by the consumers.

SOME FIGURES.

The Company had 250 employees which, taking an average of four per family, meant contact with about 1000 people, and £40,000 was paid out annually in wages and salaries. An equivalent of 45,000 tons of coal was used annually, and the annual turn-over was £150,000. The capital with which he was entrusted was about half a million pounds, and the interest and dividends represented a moderate 5 p.ct., which resulted in a low price of gas.

In conclusion, Mr. Botley said that though they did not think for one moment they were perfect, their motto was "Service," and they endeavoured to live up to it to the best of their ability.

Mr. MASON, who devoted his remarks to the more general aspects of the industry, said that gas provided the most popular, most efficient, and most thoroughly modern of household services. Eighteen million tons of coal were used every year by the industry, keeping something like 79,000 miners in regular employment.

In street lighting, for example, comparatively few people realized that what is recognized as one of the finest lighted thoroughfares in the world—Whitehall and thereabouts, including Pall Mall and the outside of Buckingham Palace—was in reality a fine example of up-to-date gas lighting.

Several questions were asked at the close of the addresses.

In answer to one question as to the relative value of gas and electricity, Mr. Botley explained that it took 29 or 30 units of electricity to equal one therm of gas.

Proposing thanks to the two speakers, the Mayor referred to the competition of electricity, and said the public always gained by competition, so he hoped there would always be a choice of services.

ILLINGWORTH CARBONIZATION COMPANY.

Development at Home and Abroad.

The meeting of the Illingworth Carbonization Company (Limited) was held on Dec. 11 in London.

Mr. SIDNEY E. ILLINGWORTH, who presided, said that the amount of capital arranged for operating the Illingworth process amounted to over a million pounds. The annual income which would accrue to the Company when those plants were operating would be close on £20,000, which, capitalized on a 10 p.ct. basis, showed a value of £200,000, or, at 8 p.ct., of £250,000. There had also been arranged royalties on construction which could be estimated at £30,000, but would not be in the nature of a yearly payment.

For £1 of capital they were already in a leading position with regard to the amount of business, and so far it had not been necessary to ask the public for money to build plants. The Company had obtained the support of the largest and most powerful interests, who were willing to finance the installation of the Illingworth process themselves.

In Great Britain the plant for Messrs. Pearson, Dorman, Long, & Co., at Snowdown, Kent, would be in operation early in the New Year, while that for a subsidiary of Messrs. Pease & Partners, (Ltd.), near Leeds, would also be at work early in 1930.

THE FRENCH COMPANY.

The French Company, the Cie. Française de Carbonization Illingworth, formed in the December of last year, was a holding Company, which included all the most powerful groups in France. The 250 tons per day plant at Courrieres was proceeding very well, and the French Company had just arranged for a plant at Maubeuge to begin with 250 tons a day. For Italy a 500 tons per day plant at Porsolla was proceeding very well for Messrs. Ricardbon Soca. Anonima, large supplies of coal for which would be drawn from British mines.

In Australia all the preliminary work for the formation of Companies, and arrangements for the first plant in conjunction with Australian Benzole and Coal Distillation had been completed, and the Board were confident that from that source most profitable results would be achieved. With regard to Canada and America, they had been able to arrange for plants at Fort William, in Canada, and for an initial 250 tons a day plant in the U.S.A.

Dr. ROY ILLINGWORTH, addressing the meeting, said: We have received valuable business in the past year, not only for the production of our smokeless fuel—"Ricoal"—but also in connection with gas supply. It is interesting to note that we are installing plant for clients with the aim of transmitting high calorific gas over long distances, and this step is part of a larger scheme. Our process is mobile as to the coals it can use, mobile as to the products; consequently, we have obtained business by virtue of fulfilling clients' requirements, and solving their problems.

FOUR MEN OVERCOME BY GAS AT CONWAY.

Gallant Rescues from Manhole.

Four men were rendered unconscious in a manhole at the old gas-works at Conway on the evening of Dec. 9. They had been engaged during the day in fitting a new valve in a 15-in. gas main below the governor house, where there is a concentration of supply mains. This work had involved the "choking" of the main at which they were working by means of an inflated bag. Sufficient gas was escaping to make it necessary for the men to have a spell in the open air in turn. A man named Harry Haig was directing the job, and with him were Charles Hall, Richard Hughes, and William Jones, all of Conway. The final operation was the withdrawal of the bag and the "plugging" of a 2-in. hole by means of a valve cap, and this was being carried out at five o'clock by the light of an electric torch.

One man was deputed to withdraw the bag and another to insert the plug—a matter of seconds, during which the men were required to hold their breath, but just at the word "go" the electric torch failed and the bag having been partially withdrawn there was a rush of gas in the manhole. William Jones, who had been holding the torch, jumped to the top of the manhole, but the other men were unable to extricate themselves from the network of piping. First Haig collapsed, and then Hall. Richard Hughes endeavoured to extricate Hall, but almost immediately became unconscious.

Jones returned with a fitter, William Hughes, and both descended into the manhole, but almost immediately Jones was overcome. Hughes, with considerable presence of mind, blocked the hole through which the gas was escaping, and then with the assistance of William Evans, the Works Foreman, got all four men to the top. This was a job of some difficulty, in the case of Haig especially, as he was in a cramped position behind some of the pipes. The men were carried into the office buildings, and during prolonged artificial respiration a cylinder of oxygen was used.

The men subsequently recovered, and were conveyed home. It was stated later that all the men were out of danger.

LOW-TEMPERATURE CARBONISATION, LTD.

Directors' Report for the Fifteen Months Ended Oct. 31.

It is stated in this report that the balance-sheet reveals a material improvement in the Company's finances, inasmuch as the assets have been greatly increased in value by the acquisition of the large share of the capital in Doncaster Coalite, Ltd., accompanied by a further substantial reduction of £54,267 in the income debenture stock. In effect, the earning capacity of the Company has been more than doubled for a relatively small increase in capital.

In the previous twelve months' account the sales and revenue totalled £64,766, but for the fifteen months under review this item is increased to £115,069, and the trading profit carried down amounts to £26,907. In this figure nothing is included on account of the profit being made at Askern, and not more than the results of two or three months' working of the new coal oil distillation plant. The Directors have been able to effect a further reduction of £54,267 in the issued amount of the 8 p.ct. cumulative income debenture stock, and, in the process of conversion, a saving was effected of £17,650. It is proposed to utilize this surplus in writing-down various assets to the extent of £16,858. The accounts show that interest on the 8 p.ct. prior lien debenture stock absorbed £15,000. The debit balance appears at £4494.

Considering the position and operations of present "Coalite" works, the report states that the plant at Barugh has been in constant operation night and day during the whole of the fifteen months. The total amount of coal actually carbonized from the commencement up to Oct. 31 was 136,720 tons. The chief products obtained were approximately as follows:

"Coalite" smokeless fuel	95,704 tons
Crude coal oil	2,324,240 galls.
Coal petrol	273,440 ,,

The second works are established at Askern, near Doncaster. Operations were commenced in July, 1929, with 144 retorts, generally similar in design to those at Barugh, but somewhat larger. The present throughput of coal is about 1450 tons per week, which will be raised to 1820 tons per week when the works are in full production. The coal used is washed smalls drawn from the adjacent colliery. The process is working easily and well, though the workmen are new to the business. The throughput in 1930 will be approximately 83,000 tons of coal, yielding the following:

"Coalite" smokeless fuel	58,000 tons
Crude coal oil	1,411,000 galls.
Coal petrol	225,000 ,,

The third works are being erected at East Greenwich for the South Metropolitan Gas Company. The plant consists of 180 of the larger type of retort, and will deal with a little over 100,000 tons of coal per annum.

A crude coal oil distillery has been erected at Barugh, and has been in operation since July last. This plant can deal with just over 4 million gallons of crude coal oil per annum. It is in full production, and the oils produced command a ready sale. There has also been put into commission a new petrol plant at this works. There is a good demand for this spirit, and the output of both the Barugh and the Askern plants has been sold for the whole of 1930.

Another works which will be of great assistance to the process is being erected at Killingholme by Petroleum Refineries, Ltd. This plant will manufacture and refine petrol and fuel oil for the British market. It will be capable of dealing with an input of 4000 barrels of crude per day, and special arrangements are being made to enable it to crack and refine the oils obtained from the operation of the "Coalite" carbonization process.

Regarding the demand for "Coalite," the report states that this continues to increase at a greater rate than the supply, and the output of several additional works could even now be easily sold.

GAS ACTS (1920 AND 1929) ORDERS.

SECTION 1.

Biggleswade and District Gas Company, Ltd.

To amend the Biggleswade and District Gas Order of 1925 by the omission therefrom of the words "one-half of." In the 1925 Order, it is provided that the amount of money borrowed by the Company shall not at any time exceed in the whole one-half of the amount of the capital raised.

SECTION 6.

Stalybridge Corporation.

The Corporation shall, from April 1, 1930, charge according to the number of B.Th.U. supplied, and shall on or before Jan. 1 give notice of the calorific value of the gas they intend to supply.

The words "7·2d. per therm" shall be substituted for "3s. per 1000 c.ft." where they first occur in section 29 (standard price and application of profits) of the Stalybridge and Mossley Gas Act, 1885, and "12d. per therm" for "5s. per 1000 c.ft." in that section.

Large consumers shall be entitled to a reduction from the price charged to the small consumers at the following rate on a yearly consumption:

Exceeding 2500 therms and not exceeding 10,000 therms, 0·2d. per therm.

Exceeding 10,000 therms, 0·4d. per therm.

DECLARATIONS OF CALORIFIC VALUE.

Bury Corporation.—465 B.Th.U. (April 1, 1930.)

Clacton Urban District Council.—470 B.Th.U. (April 1, 1930.)

Middlesbrough Corporation.—525 B.Th.U. (April 1, 1930.)

Newton-in-Makerfield Urban District Council.—390 B.Th.U. (April 1, 1930.)

Port Talbot Corporation.—425 B.Th.U. (April 1, 1930.)

COKE OVEN PLANT FIRE.

Gas Supply to Sheffield Temporarily Suspended.

The efforts of the Rotherham Fire Brigade and the members of the staff and workmen at the new coke oven plant of Messrs. Newton Chambers & Co., Ltd., at Smithywood, near Ecclesfield, on Dec. 12, when they worked for over four hours at an outbreak of fire, saved what at one period threatened to be a serious matter, and one in which the large supply of coke oven gas to the City of Sheffield was affected. The plant sends through a main to the city gas at the rate of 180,000 c.ft. per minute. This, owing to the fire, was suspended for over four hours, the main being locked up as a precautionary measure with the ovens off, in order to check the supply of gas flowing into the plant house which formed the seat of the fire.

The original outbreak was in the lime mixing shed of the sulphate of ammonia plant, which adjoins the power house of the works, and the first information of the fire was flames coming through the open door. These were seen by two members of the staff and the workmen, who ran with chemical extinguishers and applied them on the seat of the fire. The Rotherham Fire Brigade was called, and on arrival found that the outbreak had been got well under control.

Shortly afterwards, a second outbreak occurred. This was on the connecting mains of the plant, and was from a valve, which at the time was undergoing repairs, which, situated at the top of a battery of coke ovens, made the position most difficult. The Brigade, Mr. G. J. Greenfield, Manager of the plant, and many willing helpers fought desperately in order to extinguish the flames, but it was not until about 8 p.m. that the fire was got under control. This was brought about by the application of steam-blown pressure, which ended the large flare that had lighted the countryside up during the evening.

The effects of the fire will, it is stated, have no effect on the normal working, and there were no personal injuries excepting that one member of the staff suffered slight burns to the hand while endeavouring to check the original outbreak. The most serious loss will be the restricted output. The damage is as yet unknown, as is also the cause of the fire.

It was possible to resume normal working at the ovens by about 10 p.m., and the supply of gas to Sheffield was resumed.

CONTRACTS OPEN.

Carburetted Water Gas Plant.

The City of Bradford Gas Department invite tenders for the supply and erection of a carburetted water gas plant. [See advert. on p. 794.]

Pipes.

The Colwyn Bay Urban District Council invite tenders for the supply and delivery of steel mains. [See advert. on p. 794.]

FLAVELS' SOCIAL AND ATHLETIC CLUB.

Opening of New Club Premises.

A smoking concert was held in the New Club, Grove Place, Leamington, on Monday, Dec. 9, to celebrate the opening of the premises. Mr. Percival Flavel (Managing Director), who was received with musical honours, in a happy speech declared the Club officially open, and, after touching on the various activities of the Club, said he was entrusted with a special message from the Chairman, Alderman Sidney Flavel, J.P., C.A., wishing the Club every success. Mr. F. D. Riley and party from Coventry supplied the programme.

A second "smoker," held last Thursday evening, was attended by the second contingent of members, and Monday's programme was repeated with increased enthusiasm. Mr. Roberts (Foundry Manager) occupied the Chair, and, on behalf of the meeting, wished Alderman Sidney Flavel an early return to health. Mr. Sanderson, who this year completes sixty years' service with the Company, was Vice-Chairman, and wished the Club every success.

The opening ceremonies were at the invitation of Mr. Percival Flavel, J.P., the President of the Club.

CURRENT SALES OF GAS PRODUCTS.

The London Market for Tar, Tar Products, and Sulphate.

LONDON, *Dec.* 16.

There are no changes to report in the prices of tar products.

Creosote for export remains about 6½d. per gallon f.o.b.

Pitch is 47s. 6d. per ton f.o.b.

Pure toluole is 2s. 4d. per gallon; 95/160 solvent naphtha, about 1s. 5d.; pure benzole, about 1s. 11d.; and pyridine bases, 3s. 9d. to 4s. per gallon.

Tar Products in the Provinces.

Dec. 16.

There is not very much alteration in the markets for tar products.

Crude carbolic is a little easier. The consumers having covered a very large part of their requirements over next year have now reduced their prices to 2s. 6d. for immediate delivery, 2s. 5d. to 2s. 5½d. January/June, and 2s. 4d. to 2s. 4½d. July/December.

Crystals carbolic are 8d. to 8½d. for immediate delivery, and 7½d. to 7⅝d. for January/June.

The average prices of gas-works products during the week were: Gasworks tar, 25s. to 30s. Pitch—East Coast, 47s. 6d. f.o.b. West Coast—(f.a.s) Manchester, 42s. to 42s. 6d.; Liverpool, 45s. 6d. to 46s. 6d.; Clyde, 45s. 6d. to 46s. 6d. Toluole, naked, North, 1s. 7¼d. to 1s. 8¼d. Coal-tar crude naphtha, in bulk, North, 9d. to 10d. Solvent naphtha, naked, North, 1s. 3d. to 1s. 3½d. Heavy naphtha, North, 1s. to 1s. 0½d. Creosote, in bulk, North, liquid and salty, 3½d. to 3¾d.; low gravity, 2d. to 2½d.; Scotland, 3½d. to 3¾d. Heavy oils, in bulk, North, 5½d. to 6d. Carbolic acid, 60's, 2s. 4d. to 2s. 6d. prompt. Naphthalene, £12 to £14. Salts, £5 to £5 10s., bags included. Anthracene, "A" quality, 2½d. per minimum 40 p.ct., purely nominal; "B" quality, unsaleable.

Tar Products in Scotland.

GLASGOW, *Dec.* 14.

There has been no appreciable alteration in values during the week. Business is quiet, and no change is anticipated before January.

Pitch is steady at 47s. 6d. to 50s. per ton f.a.s. Glasgow. Export price is nominal as stocks are low.

Tar.—There is no alteration to report, the value remaining steady at about 3¾d. to 4⅛d. per gallon at makers' works.

Creosote.—Few orders are passing, and quotations remain as last reported. B.E.S.A. specification is 3⅝d. to 4⅛d. per gallon; light oils, 3½d. to 3¾d. per gallon; neutral oil, 3d. to 3½d. per gallon, all free on rails works in buyers' packages.

Cresylic.—The market is still short of supplies for prompt, but general position is easy. 97/99 p.ct. pale, is 1s. 9½d. to 1s. 10½d. per gallon; 97/99 p.ct. dark, 1s. 8½d. to 1s. 9½d. per gallon; 99/100 p.ct. pale, 2s. 1d. to 2s. 2d. per gallon; high boiling, 1s. 11d. to 2s. per gallon.

Crude Naphtha.—There is no change to report, price remaining easy at about 5⅝d. to 6¼d. per gallon f.o.r. makers' works.

Solvent naphtha is quiet, and stocks are gradually accumulating. Quoted prices are unaltered at 1s. 1½d. to 1s. 2d. per gallon for 90/160 grade and 1s. to 1s. 0½d. per gallon for 90/190 grade.

Motor benzole is easier at 1s. 5d. to 1s. 5½d. per gallon in bulk quantities.

Pyridine is in better demand at 3s. 3d. to 3s. 6d. per gallon for 90/160 quality. There is no demand for the heavier grades.

Benzole Prices.

The following are considered to be the market prices to-day:

	s. d.		s. d.	
Crude benzole . . .	0 10	to	0 11	per gallon at works
Motor ,, . . .	1 5	,,	1 6	,, ,, ,,
90 p.ct. ,, . . .	1 7	,,	1 8	,, ,, ,,
Pure ,, . . .	1 10	,,	1 11	,, ,, ,,

COAL TRADE REPORTS.

From Our Own Correspondents.

NORTH-EAST COAST.

The usual trouble was experienced last week of a shortage of boats, following the bad weather at sea, and in the second half of the week quite a number of collieries were in difficulties. At some there was idle time, while others were obliged to take cut prices for spot orders. Such troubles are always to be expected at this time of the year, but it is particularly unlucky now when markets have been improving after something of a setback. At the week-end, tonnage arrivals were reported better, and prices were firming up again. There is a good volume of trade for all classes to the end of the year, and inquiry is brisk into the early months of next. The position over next year is still uncertain, and details of the proposed marketing schemes are anxiously awaited.

Wear Special gas coals are quoted firm at 17s. 6d. f.o.b., and best qualities are 17s. Seconds are steady at 15s. 3d. to 15s. 9d. Coking coals are 15s. 9d. to 16s. 3d., and are in good demand for early delivery. Best qualities of Durham bunkers are scarce, and are quoted at 16s. to 16s. 9d. Seconds ask 15s. to 15s. 3d. Northumberland steams are in strong demand, and 17s. 6d. is asked as a minimum for D.C.B. qualities for the first quarter of next year.

Gas coke is unobtainable for this month, and 25s. to 26s. f.o.b. is quoted for January shipment.

YORKSHIRE AND LANCASHIRE.

The inquiry for prompt delivery of best hards in export account is much stronger, and there is some difficulty in obtaining supplies. The industrial fuel business is brighter, and the foreign is better in several grades. There is a slightly stronger demand for house coal; but this can easily be met by the collieries. The stronger demand for furnace coke continues, and quotations of 24s. to 24s. 6d. per ton are maintained. The demand for bunker fuel continues moderate, but recent quotations are maintained.

The following are the Humber bunker and export prices, f.o.b. usual shipping ports:

South Yorkshire.—Hards, Association, bunkers 19s. 3d. to 19s. 6d., export 18s. 3d. to 18s. 9d.; screened gas coal, export 18s. to 18s. 6d.; washed trebles, export 18s. to 18s. 6d.; washed doubles, bunkers 18s. 6d., export 17s. 6d. to 18s.; washed singles, export 15s. 9d. to 16s. 3d.; washed smalls (steam), bunkers 15s. 3d. to 15s. 9d., export 14s. 3d. to 14s. 9d.; washed smalls (coking), export 14s. 3d. to 15s. 3d.; rough slack, bunkers 13s. 6d. to 13s. 9d., export 12s. 6d. to 13s.; smithy peas, export 18s. 6d. to 19s. 6d.

West Yorkshire.—Hartley's (f.o.b. Goole), bunkers 17s. 9d., export 17s. to 18s.; screened gas coal, export 18s. to 18s. 6d.; washed trebles, export 17s. 6d. to 18s.; washed doubles, export 16s. 6d. to 17s.; washed singles, export 15s. 6d. to 16s.; washed smalls, bunkers 14s. 3d. to 14s. 9d., export 13s. 6d.; unwashed trebles, export 17s. to 17s. 9d.; unwashed doubles, export 15s. 6d. to 16s.; rough slack, export 9s. 6d. to 10s.; coking smalls, export 11s. 6d. to 12s.

Derbyshire and Nottinghamshire.—Top hards, bunkers 19s. 3d. to 19s. 9d., export 18s. 6s. to 19s.; cobbles, export 17s. 6d. to 18s. 6d.; washed trebles, export 17s. 9d. to 18s.; washed doubles, bunkers 18s. 3d., export 17s. to 17s. 6d.; washed singles, export 16s. to 16s. 6d.; unwashed doubles, export 16s.; rough slack, bunkers 13s. to 14s., export 12s. to 12s. 6d.; fine slack, export 9s. 6d. to 10s.

Yorkshire, Derbyshire, and Nottinghamshire.—Screened steam coal, bunkers 17s. to 18s., export 16s. 6d. to 17s.; gas coke, export 25s. to 26s. 6d.; furnace coke, export 24s. to 24s. 6d.; washed steam, Goole (West Yorkshire), bunkers 17s. 3d.; Hull (West Yorkshire), bunkers 17s. 6d.; Hull (South Yorkshire), bunkers 17s. 9d., export 17s. per ton.

MIDLANDS.

The market is sluggish all round, but no branch is so sluggish as that concerned with household coals. With pits operating about four days a week, the stringent tendency as regards slacks continues. Supplies are still obtainable, however, at little, if any, more than last week's prices. There is no increase of tension in the market for smalls.

The strength of the coke producers is emphasized by a further advance of 1s. 10d. for gas coke in Birmingham. This makes the price 34s. for local delivery—3s. 6d. more than at the beginning of October. Smelters have to reckon with increased competition for blast-furnace coke from the non-industrial consumer as a consequence of the high cost of gas coke, with the result that market stringency persists.

Negotiations for new contracts for gas coal progress very slowly. Neither collieries nor consumers seem disposed to hurry matters. Inquiries are eliciting widely divergent quotations. Sellers demand better terms than were obtainable at midsummer, suggested advances varying from 9d. to 3s. Only in rare cases are collieries seeking to put into contracts a clause protecting them against the effects of pending legislation. Industrial consumers generally elect to abide the development of events. They are not exceeding normal commitments.

Dundee Gas and Rent Bills.—The simultaneous arrival of gas bills and rent bills in November was described as a hardship to certain ratepayers at a meeting of the Treasurer's Committee of Dundee Town Council on Dec. 6. Mr. T. Stewart asked if it would not be possible to alter the date of the gas survey so as to avoid the charges falling due at the same time as the rent. The City Collector pointed out that gas bills were sent out daily throughout the year, according to districts, but he would endeavour to meet objections as far as possible.

TRADE NOTES.

Yorkshire Firm's Order for New Zealand.

Messrs. Firth Blakeley, Sons, & Co., Ltd., Gas Engineers, Church Fenton, have secured a contract for the installation of a half-million c.ft. capacity gasholder and steel tank for the Dunedin Corporation Gas Department (New Zealand). There was keen competition for this contract. The same firm recently completed a gasholder of a similar size for the Heidelberg Shire Council (Victoria), Australia.

"Acticarbone."

Messrs. Price, Stutfield, & Co., Ltd., 6, Fenchurch Buildings, announce that they have been appointed sole representatives for Great Britain and the Colonies for the activated charcoals and solvent recovery process, "Acticarbone," of Société de Recherches and d'Exploitations Petrolifères, 73, Boulevard Haussmann, Paris. The processes for the manufacture of the charcoals and for solvent recovery are patented in Great Britain and elsewhere. The Société de Recherches and d'Exploitations Petrolifères manufactures its activated charcoal in France. The "Acticarbone" process is applicable to the recovery of solvent vapours in all industrial processes, to the extraction of benzole from coal gas, petrol from oil gas, &c.; and the Company have erected a large number of plants in France, Belgium, Italy, &c., where they are working with highly satisfactory results.

Dublin Baking Prize Won by Gas.—At a Dublin baking competition organized by "Model Housekeeping," the first prize of £5 5s. was awarded to a gas consumer using a Richmond "Bungalow New World" cooker.

Power Gas Corporation announce a profit for the year amounting to £25,277. The Directors recommend the raising of the dividend by 1 p.ct. to 6 p.ct.; the carrying to reserve of £5000, as against £3000 last year; and to the credit of the next account the sum of £12,659, as compared with £10,382 last year.

Satisfactory Results at Buckhaven.—The Buckhaven and Leven Gas Commission have agreed, on the recommendation of the Manager (Mr. H. A. Aitken), to reduce the price of gas as at the next reading of the meters by 3d. per 1000 c.ft. The Manager reported that the great increase in the consumption of gas, together with the stationary expenses, had given them a surplus which he estimated at the end of the financial year would be about £900, and he calculated they could safely effect that reduction. Mr. Aitken also reported there was a record delivery of gas for November of over 12 million c.ft.—equal to an increase of a million c.ft. in the corresponding month of last year. The increase for the past six months was also very marked, while the amount of unaccounted-for gas—always a considerable item in areas marked by mineral workings and subsidences—showed a steady reduction.

British Benzol and Coal Distillation, Ltd.—The accounts for the period from June 12, 1928, to Oct. 31, 1928, show that interest receipts totalled £5664 and discounts £500. Transfer and probate fees amounted to £65, making total receipts £6229. After allowing for general expenses amounting to £6715, there is a loss carried to the balance sheet of £486. The 6 p.ct. debentures which was provided for in the prospectus, has not yet been issued. Arrangements have been made to carry the Company over the period pending the issue of the debentures, without incurring any additional cost.

Successful Rating Appeal at Devizes.—At a meeting on Dec. 4, the Devizes Corporation successfully appealed against the rate of their waterworks. For some considerable time, Mr. W. J. Rendell Baker, the Engineer, Manager, and Secretary, and his Committee had been of the opinion that the assessment was far too high. Under the re-valuation scheme the original figure was included for the waterworks, the gas-works being increased. Mr. E. Witton Booth, M.B.E., Assoc.M.Inst.C.E., of Messrs. Witton Booth & Gledhill, 29A, Dingwall Road, Croydon, was consulted, and he advised appealing against the assessment. This was successfully contested on Dec. 4, when the figure of £880 was reduced to £600.

An Unsolicited Testimonial.—The following paragraph appeared recently in the "Isle of Man Weekly Times" in connection with the Douglas Gas Light Company's new showrooms, the opening of which was referred to in the "JOURNAL" for Nov. 13, p. 467: "It is not often that we allow our columns to be used for a free advertisemen, especially if the firm or person can well afford to buy our space; but we make an exception in our rule to say a word of praise for the Gas Company's exhibition in their new showrooms in Victoria Street. Whoever designs the displays is deserving of praise. They are changed frequently, and each change is an improvement on the former one. For originality and keenness, the Gas Company are setting a high standard for others to follow."

Proposed Reconstructions at Mansfield.—At a meeting of the Mansfield Town Council on Dec. 10, the question of the reconstruction of the gas-works was considered, and the Committee stated that if the Unemployment Grants Committee would provide half the charges for the cost covering 15 years of the reconstruction of the works, which would cost £24,600, they would be able to put the plant in proper order and reduce the price of gas. Alderman T. Smith, in asking for the adoption of the report, said they had learned in London that day that they had a good chance of getting the grant, and if they did, it would enable them to meet the whole of the outstanding charges on the existing work. He referred to the inefficiency of the present plant during the last five years, and said they had spent £32,000 in maintaining their output. If the scheme was favourably received they would undoubtedly be able to reduce the price of gas. The resolution was adopted.

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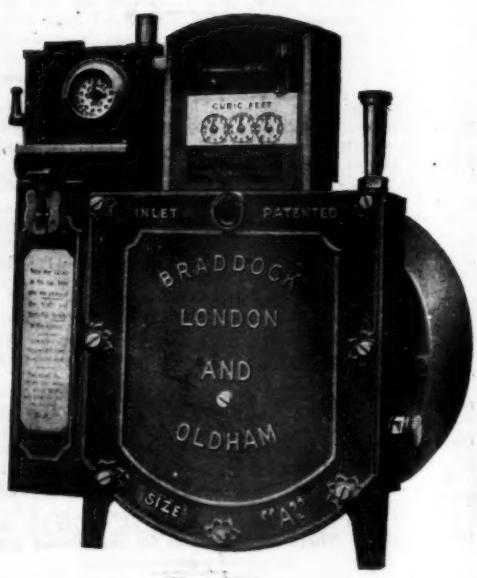

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STOCK AND SHARE LIST.

[For Stock Market Report, see earlier pages.]

Issue.	Shares.	When ex-Dividend.	Dividends, Prev. Hf.Yr	Dividends, Last Hf. Yr.	NAME.	Quotations, Dec. 13.	Rise or Fall on Week.	Transactions Lowest and Highest Prices.
£			%p.a.	% p.a.				
171,972	Stk.	Aug. 15	5	5	Aldershot 5 p.c. max. C.	70—75	..	..
419,992	,,	,,	4	4	Do. 4 p.c. Pref.	71—74	..	71—72
1,551,848	,,	Sept. 26	7½	7½	Alliance & Dublin Ord.	95—98	..	94
774,000	,,	July 11	4	4	Do. 4 p.c. Deb.	62—65	..	..
525,655	,,	Aug. 29	7	7	Barnet Ord. 7 p.c.	112—115	..	114—115
300,000	1	Oct. 24	1/4½	1/4½	Bombay, Ltd.	16/—18/-	..	..
172,500	10	Aug. 29	8½	9	Bournemouth 5 p.c.	12½—13½	..	..
150,000	10	,,	7	7	Do. B 7 p.c.	12½—12¾	..	12⅝
439,150	10	,,	6	6	Do. Pref. 6 p.c.	10¾—11	..	..
50,000	Stk.	July 11	3	3	Do. 3 p.c. Deb.	54—57	..	..
183,025	,,	,,	4	4	Do. 4 p.c. Deb.	72—75	..	..
867,900	,,	Aug. 29	7½	7½	Brighton & Hove 6 p.c. Con.	113—116	..	114
371,880	,,	,,	6½	6½	Do. 5 p.c. Con.	100—103	..	..
1,287,500	,,	July 25	5	5	Bristol 5 p.c. max.	87—89a	..	..
855,000	,,	Sept. 12	7½	7	British Ord.	114—117	..	114
100,000	,,	June 27	7	7	Do. 7 p.c. Pref.	112—117	..	..
100,000	,,	,,	4	4	Do. 4 p.c. Red. Deb.	71—74	..	..
450,000	,,	,,	6	6	Do. 5 p.c. Red. Deb.	94—97	..	96½
100,000	10	Dec. 5	8	8	Cape Town, Ltd.	8½—9¼*	..	..
100,000	10	Nov. 7	4½	4½	Do. 4½ p.c. Pref.	6¾—7½	..	..
150,000	Stk.	June 27	4½	4½	Do. 4½ p.c. Deb.	71—76	..	..
686,660	,,	July 25	6	6	Cardiff Con. Ord.	98—101	..	99
627,640	,,	June 27	7½	7½	Do. 7½ p.c. Red. Deb.	99—102	..	..
197,150	,,	Aug. 15	6½	6	Chester 5 p.c. Ord.	87—92b	..	..
98,936	1	Oct 10	†2/-	†2/-	Colombo Ltd. Ord.	24/—26/-	..	..
24,495	1	,,	1/4½	1/4½	Do. 7 p.c. Pref.	19/—21/-	..	..
875,402	1	Oct. 10	1/9½	1/9½	Colonial Gas Assn. Ld. Ord.	28/6—25/6	..	..
187,648	1	,,	1/7½	1/7½	Do. 8 p.c. Pref.	20/—22/-	..	..
1,070,280	Stk.	July 25	7	5	Commercial Ord.	90—95	..	90—90½
475,000	,,	June 18	8	8	Do. 8 p.c. Deb.	55—58	..	56½—56¾
287,650	,,	Aug. 15	7	7	Croydon sliding scale	105—108	..	105½—106
400,190	,,	,,	8	8	Do. max. div.	80—85	..	83—83½
543,270	,,	Aug. 29	10	7	Derby Con.	118—121a	..	..
88,000	,,	June 27	4	4	Do. Deb.	68—71a	..	..
300,000	,,	Aug. 29	8	8	East Hull Ord. 8 p.c.	75—76	..	..
1,002,180	10	Sept. 12	†7	†4	European, Ltd.	12¾—14¼	..	12¾—13½
12,708,480	Stk.	July 25	5½	5½	Gas Light & Coke 4 p.c. Ord.	17/9—18/3f	..	17/9—18/3
3,000,000	,,	,,	3½	3½	Do. 3½ p.c. max.	60—62	..	60½—60⅞
5,157,020	,,	,,	4	4	Do. 4 p.c. Con. Pref.	73—76	..	74—76
2,000,000	,,	June 13	3	3	Do. 3 p.c. Con. Deb.	57—59	+½	57⅞
2,643,770	,,	,,	5	5	Do. 5 p.c. Red. Deb.	98—100	+¼	98½—100
98,500	,,	Aug. 29	7	7	Hastings & St L. 5 p.c. Conv	98—103	..	99
288,740	,,	,,	6½	6½	Do. 6½ p.c. Conv.	77—82	..	..
70,000	10	Oct. 10	†10	†10	Hongkong & China, Ltd.	13½—14½	..	..
213,800	Stk.	Aug. 29	6	6½	Hornsey Con. 6½ p.c.	84—87	..	..
1,978,000	,,	Nov. 21	20	10	Imperial Continental Gas.	335—355	..	335—348
288,180	,,	Aug. 15	8½	8½	Do. 8½ p.c. Red. Deb.	71—76	..	72
285,343	,,	Aug. 15	7½	8	Lea Bridge 5 p.c. Ord.	115—118	..	..
3,148,967	,,	Aug. 15	6½	6	Liverpool 5 p.c. Ord.	91—92b	−1	..
600,000	,,	Sept. 26	7	7	Do. 7 p.c. Red. Pref.	100½—102½b	..	..
186,736	,,	Aug. 29	8	9	Maidstone 5 p.c. Cap.	122—127	..	..
68,480	,,	June 27	3	3	Do. 3 p.c. Deb.	53—56	..	..
15,000	b	Dec. 5	†10	†10	Malta & Mediterranean	5½—6*	..	..
892,000	—	Oct. 1	5½	5½	Melrop't'n (of Melbourne) 5½ p.c. Red. Deb.	93- 95	..	..
641,230	Stk	Nov. 21	†9	†6	Montevideo, Ltd.	103—106	..	105—106
1,061,818	,,	July 25	5⅜	5	Newcastle & Gateshead Con.	15/9—16/6d/	..	..
682,856	,,	,,	4	4	Do. 4 p.c. Pref.	71½ -72¾d	..	..
691,705	,,	June 27	8¼	8¼	Do. 8¼ p.c. Deb.	66¼—67¼d	..	..
181,780	,,	Aug. 29	7/1/0	7½	North Middlesex 6 p.c. Con.	112—117	..	..
396,160	,,	Aug. 15	5	5	Northampton 5 p.c. max	76—79	..	..
800,000	,,	Nov. 21	7	9	Oriental, Ltd.	108 112	..	..
305,163	,,	June 27	8	8	Plym'th & Stonehouse 5 p.c.	110—113	..	..
424,416	,,	Aug. 29	8½	8	Portsm'th Con. Stk. 4p.c. Std.	113—116	..	115
241,446	,,	,,	5	5	Do. 5 p.c. max.	80—85	..	..
3,334,464	1	June 27	—	‡5	Primitiva Ord.	28/.—31/-	..	28/11½—29/1½
244,500	100	Dec. 2	4	4	Do. 4 p.c. Red. Deb.	91—94*	..	..
895,000	Stk.	July 25	4	4	Do. 4 p.c. Red. Deb. 1911	79—82	..	..
416,345	,,	June 27	4	4	Do. 4 p.c. Cons. Deb.	79—82	..	80*—81½
180,000	10	Sept. 26	6	6	San Paulo 6 p.c. Pref.	8½—9	..	8½—9
1,736,968	Stk	Aug. 29	6½	6½	Sheffield Cons.	104—105a	..	..
95,000	,,	July 11	4	4	Do. 4 p.c. Deb.	75—77a	..	..
90,000	10	June 13	‡4	‡4	South African	4—6	..	..
2,309,895	Stk	July 26	7½	5	South Met. Ord.	99—101	..	99⅝—101
800,000	,,	,,	6	6	Do. 6 p.c. Irred. Pf.	106—109	..	106½—107½
1,098,445	,,	July 11	8	8	Do. 8 p.c. Deb.	54—57	..	..
784,000	,,	Sept. 12	6½	6½	Do. 6½ p.c. Red. Db.	98—100	..	..
91,500	,,	Aug 15	8½	8½	South Shields Con.	109—111d	..	..
1,543,795	,,	July 25	6½	6½	South Suburban Ord. 5 p.c.	101—104	..	103
469,837	,,	June 27	5	5	Do. 5 p.c. Deb.	94—97	..	94
647,740	,,	Aug 15	5	5	South'mpton Ord. 5 p.c. max	77- 80	..	..
131,275	,,	June 27	4	4	Do. 4 p.c. Deb.	70- 73	..	..
179,014	,,	July 25	8	8	Sutton Ord.	116—119	..	..
67,828	,,	June 27	5	5	Do. 5 p.c. Deb.	90—93	..	..
260,000	,,	Feb. 21	7	7	Swansea 7 p.c. Red. Pref.	100—102	..	..
200,000	,,	June 27	6½	6½	Do. 6½ p.c. Red. Deb.	100—102	..	..
1,002,278	,,	Aug. 15	6½	6½	Tottenham District Ord.	101—106	..	105½
150,000	,,	,,	5½	5½	Do. 5½ p.c. Pref.	97—100	..	..
181,355	,,	Dec. 5	4	4	Do. 4 p.c. Deb.	73—75*	..	73½
389,094	,,	Aug. 29	7	7	Uxbridge, Maidenhead, & Wycombe 5 p.c.	97—102	..	..
98,880	,,	,,	5	5	Do. 5 p.c. pref.	85—90	..	..
80,000	,,	July 11	9	9	Wandsworth, Wimbledon, and Epsom— Wandsworth A 5 p.c.	135—140	..	..
355,636	,,	,,	7½	7½	Do. B 5½ p.c.	112—117	..	..
432,535	,,	,,	6.5	6.5	Do. C and New	95—100	..	..
382,000	,,	,,	7½	7½	Do. Wimbledon 5 p.c.	105—110	..	106
95,000	,,	,,	7½	7½	Do. Epsom 5 p.c.	113—118	..	..
100,000	,,	,,	5	5	Do. 5 p.c. Pref	87—92	..	..
88,416	,,	June 27	3	3	Do. 3 p.c. Deb.	54—57	..	..
284,742	,,	,,	4	4	Do. 4 p.c. Deb.	74—77	..	..
307,660	,,	,,	6	6	Do. 5 p.c. Deb.	93—96	..	..

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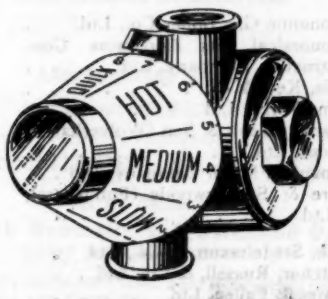

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No notice can be taken of anonymous communications. Whatever is intended for insertion in the "JOURNAL" must be authenticated by the name and address of the writer—not necessarily for publication but as a proof of good faith.

CHRISTMAS HOLIDAYS.

Owing to the Christmas Holiday, it will be necessary to go to press with the number of the "JOURNAL" for Dec. 25 earlier than usual. All communications intended for this issue should reach us not later than the first post on Friday, Dec. 20.

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N. L. FLEMING,
Town Clerk.

Town Hall, Bradford,
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JAMES AMPHLETT,
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Council Offices,
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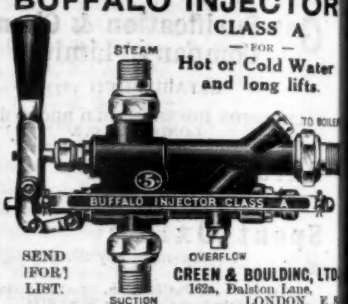

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